

Sparse Matrix Mapping Draft 5

10/14/2009

[Number of Sparse Labels]

Rules for Version 1.0-2.0 Files:

[Number of Sparse Labels] is not permitted in Version 1.0-2.0 Files.

Rules for Version 2.1 Files:

[Number of Sparse Labels] describes how many columns of data will appear for each frequency in [Network Data], and how many Integer Labels will appear under the [Sparse Matrix Mapping] keyword. (Need to add words under [Network Data] keyword to reflect this.)

Note that, if [Number of Sparse Labels] is present, the number of entries under [Network Data] does NOT need to match the size of a matrix given by [Number of Ports] x [Number of Ports]. Instead, the number of Integer Labels under the [Network Data] keyword must match the number of colon-separated groups under the [Sparse Matrix Mapping] keyword.

[Number of Sparse Labels] is required if [Sparse Matrix Mapping] is present. Otherwise, it is prohibited.

[Number of Sparse Labels] accepts a single integer argument with value greater than zero. The value must match the number of Integer Labels used under [Sparse Matrix Mapping]. The argument may appear immediately after the keyword, or may they may be separated by a line termination sequence.

[Number of Sparse Labels] shall appear after the [Number of Ports] keyword and before any network data.

[Sparse Matrix Mapping]

Rules for Version 1.0-2.0 Files:

[Sparse Matrix Mapping] is not permitted in Version 1.0-2.0 Files.

Rules for Version 2.1 Files:

[Sparse Matrix Mapping] is an optional keyword describing how the data under [Network Data] maps into a larger matrix (n by n, where n is given by [Number of Ports]).

[Sparse Matrix Mapping] shall appear after the [Number of Ports] keyword and before any network data. The [Network Data] keyword data given later in the file changes in meaning from expressing data in a full matrix to expressing the data points remapped into the full matrix by the contents of the [Sparse Matrix Mapping] keyword.

[Sparse Matrix Mapping] contains two kinds of arguments Integer Labels and Index Pairs:

Integer Labels are integer numbers followed by the colon character. All Index Pairs after an Integer Labels and before the next Integer Label or the end of [Spares Matrix Mapping] refer to the column in [Network Data] corresponding to the first Integer Labels and therefore force the corresponding entries in the full matrix to be identical.

| Integer Labels are required, must be numerically increasing and the sequence must begin with 1.

| Integer Labels may not be re-used.

Index Pairs may not be duplicated either within an Integer Label group or between two or more Integer Label groups.

The last Integer Label shall be the same as the [Number of Sparse Labels].

White space is not permitted between the Integer Label and the colon character.

White space is required before and after an Integer Label.

Index Pairs: pairs of integers specifying a row and column in the full matrix to which the data in the corresponding Integer Label in the [Network Data] keyword is mapped.

In each Index Pair, row is always the first integer and column is always the second. Zero values are not permitted within an Index Pair. The value for any row or column in an Index Pair must be no larger than the [Number of Ports] argument.

For example, if the very first Index Pair under [Sparse Matrix Mapping] is (1,5) and the first row and column of [Network Data] contains the real/imaginary pair 7 -0.8, then the values 7 -0.8 are assumed to occupy row 1, column 5 of the full, final matrix described by [Number of Ports].

The row and column in an Index Pair are separated by a comma, are preceded by an open parenthesis and followed by a close parenthesis.

White space is not permitted after the open parenthesis and before the closed parenthesis of an Index Pair.

White space is required between Index Pairs.

Data in the full matrix that is not indicated by a matrix pair under [Sparse Matrix Mapping] is assumed to be zero-valued.

[Sparse Matrix Mapping] assumes that the matrix mapping between its entries and those of [Network Data] are unchanged across all frequency points given under [Network Data].

Multiple Index Labels may appear on the same line. Index Labels and associated Index Pairs may be separated by a line-termination sequence. An empty Index Label is an Integer Label followed by another Integer Label or the end of [Sparse Matrix Mapping] without an intervening Index Pair. Empty Labels are (not?) permitted.

[Sparse Matrix Mapping] must contain at least one Integer Label. The number of Integer Labels must agree with the argument used for [Number of Sparse Labels].

Lists of Index Pairs may span multiple lines.

The maximum number of Index Pairs under [Sparse Matrix Mapping] is given by the value given by [Number of Ports] x [Number of Ports].

Note that [Mixed-Mode Order], [Matrix Format], [Reference Impedance] and [Number of Ports] rules do not change. [Mixed-Mode Order], [Matrix Format], [Reference Impedance] and [Number of Ports] describe the full matrix which is populated by the contents of [Sparse Matrix Data] and [Network Data]. When [Matrix Format] is “Upper” then row must be less than or equal to column, and when [Matrix Format] is “Lower” then row must be greater than or equal to column.

Example xx (Version 2.0):

```
[Version] 2.0
# GHz S MA R 50
[Number of Ports] 4
[Number of Frequencies] 1
[Reference] 50 75 0.01 0.01
[Matrix Format] Full
[Number of Sparse Labels]
4
[Sparse Matrix Mapping]
1: (1,1) (2,2) (3,3) (4,4) 2: (3,1) (4,2) 3: 4: (4,1) (2,1) (3,2) (4,3)
```

[Network Data]
5.00000 0.60 161.24 0.40 -42.20 .999 .999 0.42 -66.58
Sparse Labels

[End]

This describes the 4x4 matrix shown below:

0.60 161.24	0 0	0 0	0 0
0.42 -66.58	0.60 161.24	0 0	0 0
0.40 -42.20	0.42 -66.58	0.60 161.24	0 0
0.42 -66.58	0.40 -42.20	0.42 -66.58	0.60 161.24

Other equivalent representations

[Sparse Matrix Mapping]
1: (1,1) (2,2) (3,3) (4,4)
2: (3,1) (4,2)
3:
4:(4,1) (2,1) (3,2) (4,3)
[Network Data]

[Sparse Matrix Mapping]
1:
(1,1) (2,2) (3,3) (4,4)
2:
(3,1) (4,2)
3:
4:
(4,1) (2,1) (3,2) (4,3)
[Network Data]

[Sparse Matrix Mapping]
1:
(1,1)
(2,2)
(3,3)
(4,4)
2:
(3,1)
(4,2)
3:
4:

(4,1)
(2,1)
(3,2)
(4,3)
[Network Data]