External data file option

This option allows entering an external data file containing impedance and admittance matrices. This option permits the creation of frequency dependent cable models using parameter calculation techniques different from those used in the EMTP Cable Data module. There is no specific test performed for this matter in the EMTP.

The number of points and frequency scale spacing of the externally supplied data must match those specified in the “Model” data tab.

The structure of the external data must adhere to the following rules:

- Any number of comment lines can be used at the beginning of the file. Each line must start with “C “ or “c “ in columns 1 and 2. Comment lines among the data lines are not allowed.
- The first data line provides the number of phases. This number must match the number of phases specified on this data tab.
- One record containing the following matrix frequency F in Hz, followed by data records containing the row-wise lower triangle matrices: impedance matrix Z in Ohms/km and admittance matrix Y in S/km. For example, if the number of phases is 3, then the following lines are needed (the subscript “r” means real part, the subscript “i” means imaginary part:

F

$Z_r(1,1)$ $Z_i(1,1)$ $Z_r(2,1)$ $Z_i(2,1)$ $Z_r(2,2)$

$Z_i(2,2)$ $Z_r(3,1)$ $Z_i(3,1)$ $Z_r(3,2)$ $Z_i(3,2)$

$Z_r(3,3)$ $Z_i(3,3)$

$Y_r(1,1)$ $Y_i(1,1)$ $Y_r(2,1)$ $Y_i(2,1)$ $Y_r(2,2)$

$Y_i(2,2)$ $Y_r(3,1)$ $Y_i(3,1)$ $Y_r(3,2)$ $Y_i(3,2)$

$Y_r(3,3)$ $Y_i(3,3)$

If it is desired to use Ohms/m and S/m then the cable length can be also specified in meters on the “Cable length” data tab.

The total number of frequency samples depends on the type of model to be generated. *The choices are made on the Model data tab*. If there is only one phase, then it is needed to provide

(Number of decades)*(Points per Decade)+2 points as follows:

f_{dc}

$F(1) = f_{min}$

$$F(2) = F(1) * 10^{\frac{1}{PpD}}$$

$$F(3) = F(2) * 10^{\frac{1}{PpD}}$$

where PpD is the number of “Points per Decade”.

If there is more than one phase, then the samples must be organized as follows:

f_Q

f_{dc}

$F(1) = f_{min}$

$$F(2) = F(1) * 10^{\frac{1}{PpD}}$$

$$F(3) = F(2) * 10^{\frac{1}{PpD}}$$

The frequency f_Q is the frequency at which the constant modal transformation matrix **Q** must be evaluated (from Z and Y at f_Q). In the case of FDQ type of matrix, f_Q is the frequency at which the seeding **Q** is evaluated, usually $f_Q = f_{min}$.