Importtsi.m

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Importtsi.m  is a function to import Touchstone file. It is a wrapper for importts.m for signal integrity applications (hence the last letter “i” in the function name importtsi.m). The return struct snp in importts.m is simplified in importtsi.m by eliminating the noise data and, combining the real and imaginary parts into a single complex variable.

Signature and associated comments of the function is shown below,

```
function [snpi, er, em] = importtsi(fxnp,varargin)
% (c) Jianhua Zhou 2010,2011,2012,2013,2014
%
% Description: imports a touchstone file and returns the snpi struct
%
% fxnp: Touchstone file to be loaded.
%      The file format must be compliant with Touchstone V1.1 Specification
%      The file could have any extension in its name
%      The file could contain any S, Y, Z, H, or G parameters
%         (even though H or G parameters are rarely used in signal integrity, this function treats all these
parameters equally well)
%
% output:
% snpi: (struct) returns the imported network parameter data
%    dat: complex data matrix of dimension nfreq * nport * nport
%        MA and DB formats are converted to RI before assigning to complex "dat"
%                        //  d2: data matrix, second half, dimension nfreq * nport * nport
%                        //dn: data matrix, noise, dimension nnfreq * 4
%    nport: (integer) number of ports
%    nfreq: (integer) number of frequencies
%                        //nnfreq: (integer) number of noise frequencies
%                        //frequnit: (string) frequency unit: GHz, MHz, KHz, Hz
%    parameter: (string) S,Y,Z,H,G
%                        // format: (string) MA, DB, RI
%    R: (double) reference impedance, must be a real number of type double
%
%    freqlist: list of frequencies in Hz
%                        //nfreqlist: list of frequencies for noise parameters
% er: (integer) indicating error condition:
%     0: no errors, with or without warnings
%     >0 : fatal error, abnormal exit of function, no output is produced
% em: a string containing log messages, error and warning messages
% note: (2014-02-07) importtsi is a wrapper of importts, with simplified
%      return data struct. The following fields are eliminated:
```

%  (1) all noise related fields (noise data are never used in signal integrity)
%  (2) frequnit (all freq units are converted to Hz)
%  (3) format (all MA and DB are converted to RI before assigning to complex "dat")
%  (4) the data returns one complex array "dat"

The comments are quite complete, more explanations are given below for those who are not familiar with Touchstone V1.1 Specification and new to network parameters.

In Touchstone, data can be in MA, DB or RI format, meaning magnitude/angle, dB or real/imaginary. This is recorded in “format” variable. In the snpi return struct, all data are converted to real/imaginary, the “format” variable is eliminated. The “dat” member of snpi is the complex matrix comprising of both the real and imaginary parts.

Also in Touchstone, the frequency units can be Hz, KHz, MHz, GHz, recorded in the option line. To simplify the matter, all frequencies are converted to Hz before assigning to “freqlist”.

Touchstone Specification allows S,Y,Z,H,G “parameters”. It has absolutely no impact on the importtsi.m function in terms of what parameters are contained in the Touchstone file. It merely reads the data, converts into the RI format and returns the data struct.

Please note that even though the return struct is labeled as “snpi”, it actually might be any of the above parameters. The user is responsible to verify the data before using it in subsequent analysis.

“R” is the reference impedance of the network parameter.

List of files in this package:

1. importtsi.m
2. importts.p
3. importtsi_test.m
4. one or more example Touchstone file(s)

importts.p is the pcode for the importts.m function. It contains the codes used by importtsi.m, the user does not need to call this function directly.

Importtsi_test.m is an example test function to show how to make calls to importtsi.m