S3P Sample Inputs

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A complete example for S3P computation

```
ModelInfo: {
  File: cell.ncdf
  BoundaryCondition: {
     Magnetic: 1 3 4
     Impedance: 6                //Impedance boundary condition
     Waveguide: 7 8             //the ports where waveguide can be loaded
  }
  SurfaceMaterial: {
    ReferenceNumber: 6      //surface material property
    Sigma: 5.8e7
  }
}

Port : {
      ReferenceNumber: 7
      Origin:     0.0, 0.04105, 0.0
      XDirection: 1.0, 0.0, 0.0
      YDirection: 0.0, 0.0, -1.0
      ESolver: {
              Type: Analytic
              Mode: {
                      WaveguideType: Rectangular
                      ModeType: TE, 1, 0
                      A: 0.028499    //larger dimension
                      B: 0.00895      //smaller dimension
              }
      }
}

Port : {
      ReferenceNumber: 8
      Origin:     0.0, -0.04105, 0.0
      XDirection: 1.0, 0.0, 0.0
      YDirection: 0.0, 0.0, -1.0
      ESolver: {
              Type: Analytic
              Mode: {
                      WaveguideType: Rectangular
                      ModeType: TE, 1, 0
                      A: 0.028499    //larger dimension
                      B: 0.00895      //smaller dimension
              }
      }
}

FrequencyScan: {  //enable frequency scan of S parameter
  Start: 9.33e+9
  End:   9.48e+9
  Interval: 0.01e+9
}

WaveguideFrequency: 9.4e+9 //if FrequencyScan container does not exist,  compute S parameter at this frequency

PostProcess: {
  Toggle: off        //switch for postprocess
  Port Number: 1 //input port
  ModeFile: coupler.portMode   //the mode file prefix for field distribution
}
```

A complete example with impedance boundary condition

```
ModelInfo: {

  File: cell.ncdf
```

```
  BoundaryCondition: {
    Magnetic: 1 3 4
    Impedance: 6
    Waveguide: 7 8
  }

  SurfaceMaterial: {
    ReferenceNumber: 6
    Sigma: 5.8e7
  }

}

Port : {
        Reference number: 7
        Origin:     0.0, 0.04105, 0.0
        XDirection: 1.0, 0.0, 0.0
        YDirection: 0.0, 0.0, -1.0
        ESolver: {
                Type: Analytic
                Mode: {
                        Waveguide type: Rectangular
                        Mode type: TE, 1, 0
                        A: 0.028499
                        B: 0.00895
                }
        }
}

Port : {
        Reference number: 8
        Origin:     0.0, -0.04105, 0.0
        XDirection: 1.0, 0.0, 0.0
        YDirection: 0.0, 0.0, 1.0
        ESolver:  {
                Type: Analytic
                Mode: {
                        Waveguide type: Rectangular
                        Mode type: TE, 1, 0
                        A: 0.028499
                        B: 0.00895
                }
        }
}

FiniteElement: {
  Order: 2
  CurvedSurfaces: on
}

FrequencyScan: {
 Start: 9.33e+9
 End:   9.48e+9
 Interval: 0.01e+9
}

PostProcess: {
  Toggle: off
  Port Number: 0 //input port
  ModeFile: field
}

VerifyLinearSolver: yes

LinearSolver: {
        Solver:        MUMPS
}
```

Specify lossy materials

```
ModelInfo: {
 File: tapereda.ncdf
 BoundaryCondition: {
   Magnetic: 1
   Electric: 2
   Exterior: 6
   Waveguide: 7
 }
 Material : {
   Attribute: 1            //block 1 is vacuum
   Epsilon:   1.0
   Mu:        1.0
 }
 Material : {
   Attribute: 2           //block 2 is lossy (cubit block)
   Epsilon:   3.0
   Mu:        1.0
   EpsilonImag: -5.4  //lossy material
 }
}
```

A complete example with an absorbing boundary condition

For example, we can use ABC to approximate the case that there is no metal enclosure.

```
 ModelInfo: {
   File: pb.ncdf
   BoundaryCondition: {
     Waveguide: 3
     Magnetic: 1 2
     Electric: 4
     Exterior: 6
     Absorbing: 5  //the surface 5 is the outer boundary of the computational domain.
   }
 }

 FiniteElement: {
   Order: 2
   CurvedSurfaces: on
 }

 WaveguideFrequency: 6.77585e7

 PostProcess: {
   Toggle: on
   ModeFile: o
 }

//reflection coefficient from MAFIA is 0.5115. we computed it as 0.5105.

 Port: {
    ReferenceNumber: 3
    Origin:     0.0, 0.0, -1.0
    XDirection: 1.0, 0.0,  0.0
    YDirection: 0.0, 1.0,  0.0
    ESolver: {
               Type: Analytic
               Mode:{
                       WaveguideType: Circular
                       Mode type: TM 0 1
                       A: 2
               }
    }
 }

 Port: {  //just load two modes in the same port to make S3P happy.
    ReferenceNumber: 3
    Origin:     0.0, 0.0,  -1.0
    XDirection: 1.0, 0.0,  0.0
    YDirection: 0.0, 1.0,  0.0
    ESolver: {
               Type: Analytic
               Mode:{
                       WaveguideType: Circular
                       ModeType: TE 0 1
                       A: 2
                }
      }

  }
```

Use interpolative port mode

If one has waveguide with shape that does not have analytical solution, one can compute the numerical solution using other programs and used in S3P. The following in the input for an interpolative Port mode.

```
  Port: {
    Reference number: 1
    Origin:     0.0, 0.0, -0.25
    XDirection: 1.0, 0.0,  0.0
    YDirection: 0.0, 1.0,  0.0
    ESolver: {
               Type: Interpolative
               Mode:{
                       ExFile: ex0.prn   //the file that stores Ex file on a grid
                       EyFile: ey0.prn    //Ey field
                       BxFile: bx0.prn   //Bx field
                       ByFile: by0.prn   //By field
               }
    }
 }
```

The following is an excerpt of the ex0.prn

```
%  ix  iy          x             y         Ex
   1   1  4.9541509E-03  0.0000000E+00  1.0000000E+00
   2   1  1.4862453E-02  0.0000000E+00  9.9983907E-01
   3   1  2.4770755E-02  0.0000000E+00  9.9951762E-01
   4   1  3.4679055E-02  0.0000000E+00  9.9903518E-01
   5   1  4.4587359E-02  0.0000000E+00  9.9839246E-01
   6   1  5.4495662E-02  0.0000000E+00  9.9758929E-01
   7   1  6.4403966E-02  0.0000000E+00  9.9662626E-01
   8   1  7.4312270E-02  0.0000000E+00  9.9550349E-01
   9   1  8.4220573E-02  0.0000000E+00  9.9422133E-01
  10   1  9.4128877E-02  0.0000000E+00  9.9278009E-01
  11   1  1.0403718E-01  0.0000000E+00  9.9118054E-01
  12   1  1.1394548E-01  0.0000000E+00  9.8942298E-01
  13   1  1.2385379E-01  0.0000000E+00  9.8750800E-01
  14   1  1.3376209E-01  0.0000000E+00  9.8543614E-01
  15   1  1.4367038E-01  0.0000000E+00  9.8320812E-01
  16   1  1.5357870E-01  0.0000000E+00  9.8082447E-01
  17   1  1.6348699E-01  0.0000000E+00  9.7828639E-01
  18   1  1.7339531E-01  0.0000000E+00  9.7559416E-01
  19   1  1.8330359E-01  0.0000000E+00  9.7274888E-01
  20   1  1.9321191E-01  0.0000000E+00  9.6975166E-01
  21   1  2.0312020E-01  0.0000000E+00  9.6660298E-01
  22   1  2.1302852E-01  0.0000000E+00  9.6330404E-01
  23   1  2.2293681E-01  0.0000000E+00  9.5985591E-01
  24   1  2.3284513E-01  0.0000000E+00  9.5625961E-01
  25   1  2.4275342E-01  0.0000000E+00  9.5251644E-01
  26   1  2.5266171E-01  0.0000000E+00  9.4862741E-01
  27   1  2.6257002E-01  0.0000000E+00  9.4459367E-01
  28   1  2.7247828E-01  0.0000000E+00  9.4041634E-01
  29   1  2.8238660E-01  0.0000000E+00  9.3609643E-01
  30   1  2.9235250E-01  0.0000000E+00  9.3160993E-01
  31   1  3.0237597E-01  0.0000000E+00  9.2695469E-01
  32   1  3.1239951E-01  0.0000000E+00  9.2215794E-01
  33   1  3.2242298E-01  0.0000000E+00  9.1722095E-01
  34   1  3.3244652E-01  0.0000000E+00  9.1214532E-01
  35   1  3.4246999E-01  0.0000000E+00  9.0693265E-01
  36   1  3.5249352E-01  0.0000000E+00  9.0158427E-01
  37   1  3.6251700E-01  0.0000000E+00  8.9610177E-01
  38   1  3.7254053E-01  0.0000000E+00  8.9048654E-01
  39   1  3.8256401E-01  0.0000000E+00  8.8474029E-01
  40   1  3.9258754E-01  0.0000000E+00  8.7886447E-01
  41   1  4.0261102E-01  0.0000000E+00  8.7286055E-01
  42   1  4.1263455E-01  0.0000000E+00  8.6672992E-01
  43   1  4.2265803E-01  0.0000000E+00  8.6047405E-01
  44   1  4.3268156E-01  0.0000000E+00  8.5409439E-01
  45   1  4.4270504E-01  0.0000000E+00  8.4759194E-01
  46   1  4.5272857E-01  0.0000000E+00  8.4096813E-01
  47   1  4.6275204E-01  0.0000000E+00  8.3422428E-01
```

```
 48   1  4.7277558E-01  0.0000000E+00  8.2736099E-01
 49   1  4.8279905E-01  0.0000000E+00  8.2037938E-01
 50   1  4.9282259E-01  0.0000000E+00  8.1327999E-01
 51   1  5.0284612E-01  0.0000000E+00  8.0606312E-01
 52   1  5.1286960E-01  0.0000000E+00  7.9872894E-01
 53   1  5.2289319E-01  0.0000000E+00  7.9127711E-01
 54   1  5.3291667E-01  0.0000000E+00  7.8370643E-01
 55   1  5.4294026E-01  0.0000000E+00  7.7601600E-01
 56   1  5.5296373E-01  0.0000000E+00  7.6820403E-01
 57   1  5.6298733E-01  0.0000000E+00  7.6026773E-01
 58   1  5.7301080E-01  0.0000000E+00  7.5220412E-01
 59   1  5.8303440E-01  0.0000000E+00  7.4400985E-01
 60   1  5.9305787E-01  0.0000000E+00  7.3568153E-01
 61   1  6.0308146E-01  0.0000000E+00  7.2721678E-01
 62   1  6.1310494E-01  0.0000000E+00  7.1861577E-01
 63   1  6.2312853E-01  0.0000000E+00  7.0988470E-01
 64   1  6.3315201E-01  0.0000000E+00  7.0104182E-01
 65   1  6.4317560E-01  0.0000000E+00  6.9212669E-01
 66   1  6.5319908E-01  0.0000000E+00  6.8321538E-01
 67   1  6.6322267E-01  0.0000000E+00  6.7444330E-01
 68   1  6.7324615E-01  0.0000000E+00  6.6603261E-01
 69   1  6.8326974E-01  0.0000000E+00  6.5832037E-01
 70   1  6.9329321E-01  0.0000000E+00  6.5176833E-01
 71   1  7.0331681E-01  0.0000000E+00  6.4692903E-01
 72   1  7.1334028E-01  0.0000000E+00  6.4433753E-01
  1   2  4.9541509E-03  9.9083018E-03  9.9975830E-01
  2   2  1.4862453E-02  9.9083018E-03  9.9959749E-01
  3   2  2.4770755E-02  9.9083018E-03  9.9927610E-01
  4   2  3.4679055E-02  9.9083018E-03  9.9879372E-01
  5   2  4.4587359E-02  9.9083018E-03  9.9815118E-01
  6   2  5.4495662E-02  9.9083018E-03  9.9734813E-01
  7   2  6.4403966E-02  9.9083018E-03  9.9638516E-01
  8   2  7.4312270E-02  9.9083018E-03  9.9526256E-01
  ...
 60  73  5.9305787E-01  7.1835208E-01  0.0000000E+00
 61  73  6.0308146E-01  7.1835208E-01  0.0000000E+00
 62  73  6.1310494E-01  7.1835208E-01  0.0000000E+00
 63  73  6.2312853E-01  7.1835208E-01  0.0000000E+00
 64  73  6.3315201E-01  7.1835208E-01  0.0000000E+00
 65  73  6.4317560E-01  7.1835208E-01  0.0000000E+00
 66  73  6.5319908E-01  7.1835208E-01  0.0000000E+00
 67  73  6.6322267E-01  7.1835208E-01  0.0000000E+00
 68  73  6.7324615E-01  7.1835208E-01  0.0000000E+00
 69  73  6.8326974E-01  7.1835208E-01  0.0000000E+00
 70  73  6.9329321E-01  7.1835208E-01  0.0000000E+00
 71  73  7.0331681E-01  7.1835208E-01  0.0000000E+00
 72  73  7.1334028E-01  7.1835208E-01  0.0000000E+00
```