[](https://www.comsol.com/)

90 three wave

|  |  |
| --- | --- |
| Report date | Oct 29, 2021 2:43:46 PM |

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1. Global Definitions

|  |  |
| --- | --- |
| Date | Jun 26, 2021 11:33:47 AM |

Global settings

|  |  |
| --- | --- |
| Name | 90 three wave.mph |
| Path | D:\comsol models\_for silver\90\_three\_wave.mph |
| Version | COMSOL Multiphysics 5.6 (Build: 341) |

Used products

|  |
| --- |
| COMSOL Multiphysics |
| CAD Import Module |
| Wave Optics Module |

Computer information

|  |  |
| --- | --- |
| CPU | Intel64 Family 6 Model 85 Stepping 4, 6 cores |
| Operating system | Windows 10 |

* 1. Parameters

Parameters 1

| **Name** | **Expression** | **Value** | **Description** |
| --- | --- | --- | --- |
| wl | 1095 [nm] | 1.095E−6 m | Wavelength |
| k0 | 2\*pi/wl | 5.7381E6 1/m | Wave vector |
| f0 | c\_const/wl | 2.7378E14 1/s | frequency |
| w | 2\*pi\*c\_const/wl | 1.7202E15 1/s |  |
| na | 1.33 | 1.33 |  |
| I0 | 1[W/m^2] | 1 W/m² | Intensity of Incident wave |
| pitch | 900[nm] | 9E−7 m |  |
| n\_h | 2 | 2 |  |
| w\_h | 720 [nm] | 7.2E−7 m |  |
| l\_h | n\_h\*pitch | 1.8E−6 m |  |
| t\_h | 100[nm] | 1E−7 m |  |
| water\_h | l\_h/2 + 500[nm] | 1.4E−6 m |  |
| alpha | 0[rad] | 0 rad |  |
| beta | pi/2[rad] | 1.5708 rad |  |
| theta | 0[rad] | 0 rad |  |
| pml\_t | 300 [nm] | 3E−7 m |  |
| P | a\*a\*I0 | 4E−12 W | port power |
| a | 2000[nm] | 2E−6 m |  |
| b | 4000[nm] | 4E−6 m |  |
| c | 1 | 1 |  |

1. Component 1

Settings

| **Description** | **Value** |
| --- | --- |
| Unit system | Same as global system (SI) |
| Avoid inverted elements by curving interior domain elements | Off |

* 1. Definitions
     1. Variables

#### Variables 3

Selection

|  |  |
| --- | --- |
| Geometric entity level | Entire model |

| **Name** | **Expression** | **Unit** | **Description** |
| --- | --- | --- | --- |
| nrelPoav | nx\*ewfd2.relPoavx + ny\*ewfd2.relPoavy + nz\*ewfd2.relPoavz | W/m² | """""" |
| sigma\_sc | intop01(nrelPoav)/I0 | m² | scattering |
| sigma\_abs | intop00(ewfd2.Qh)/I0 | m² | absorption |
| sigma\_ext | sigma\_sc + sigma\_abs | m² | extinction |

#### Variables 4

Selection

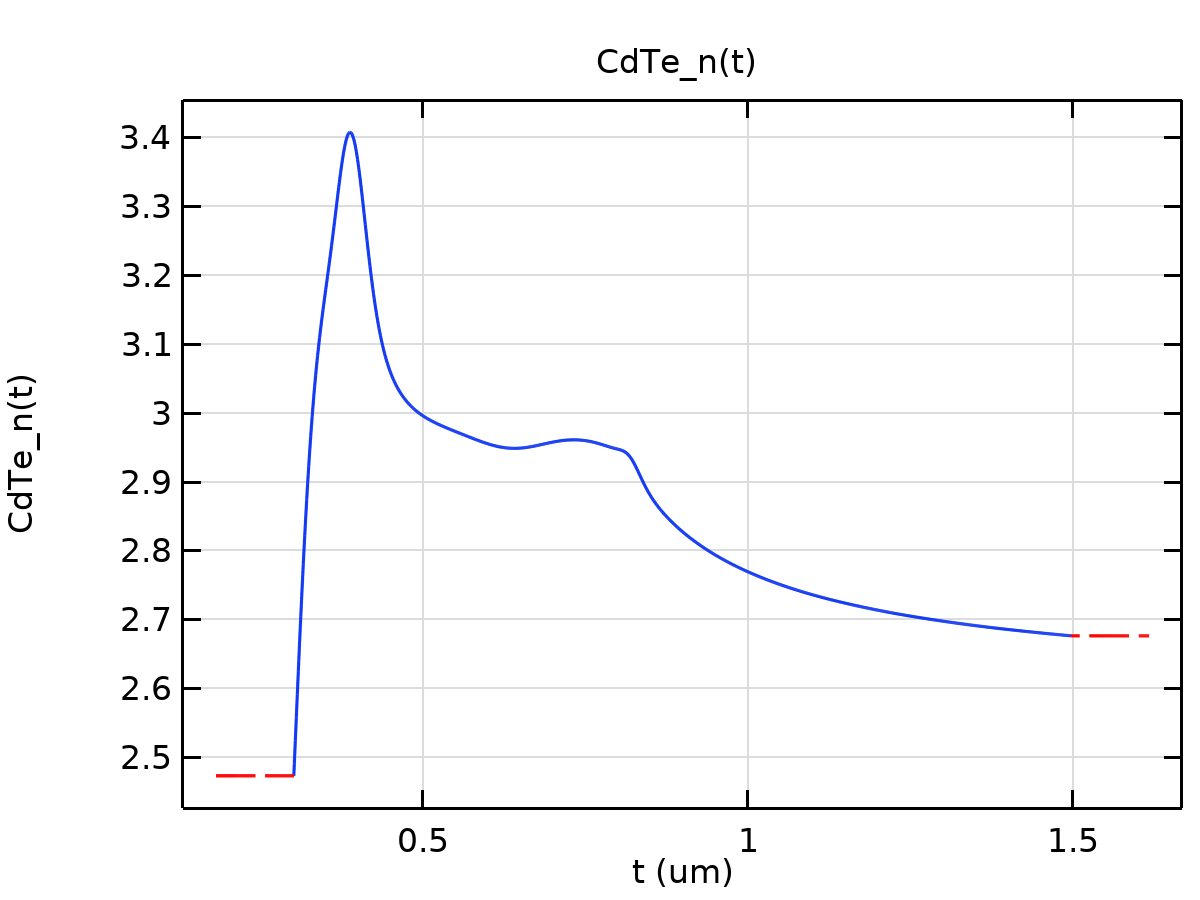
|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Name | PML |
| Selection | Named com1: Geometry geom1: Dimension 3: Domains 1–13, 15–18, 20–28 |

| **Name** | **Expression** | **Unit** | **Description** |
| --- | --- | --- | --- |
| ewfd.Ex | 0 [V/m] | V/m |  |
| ewfd.Ey | 0 [V/m] | V/m |  |
| ewfd.Ez | 0 [V/m] | V/m |  |

* + 1. Functions

#### Interpolation 1

|  |  |
| --- | --- |
| Function names | CdTe\_n |
| Function type | Interpolation |



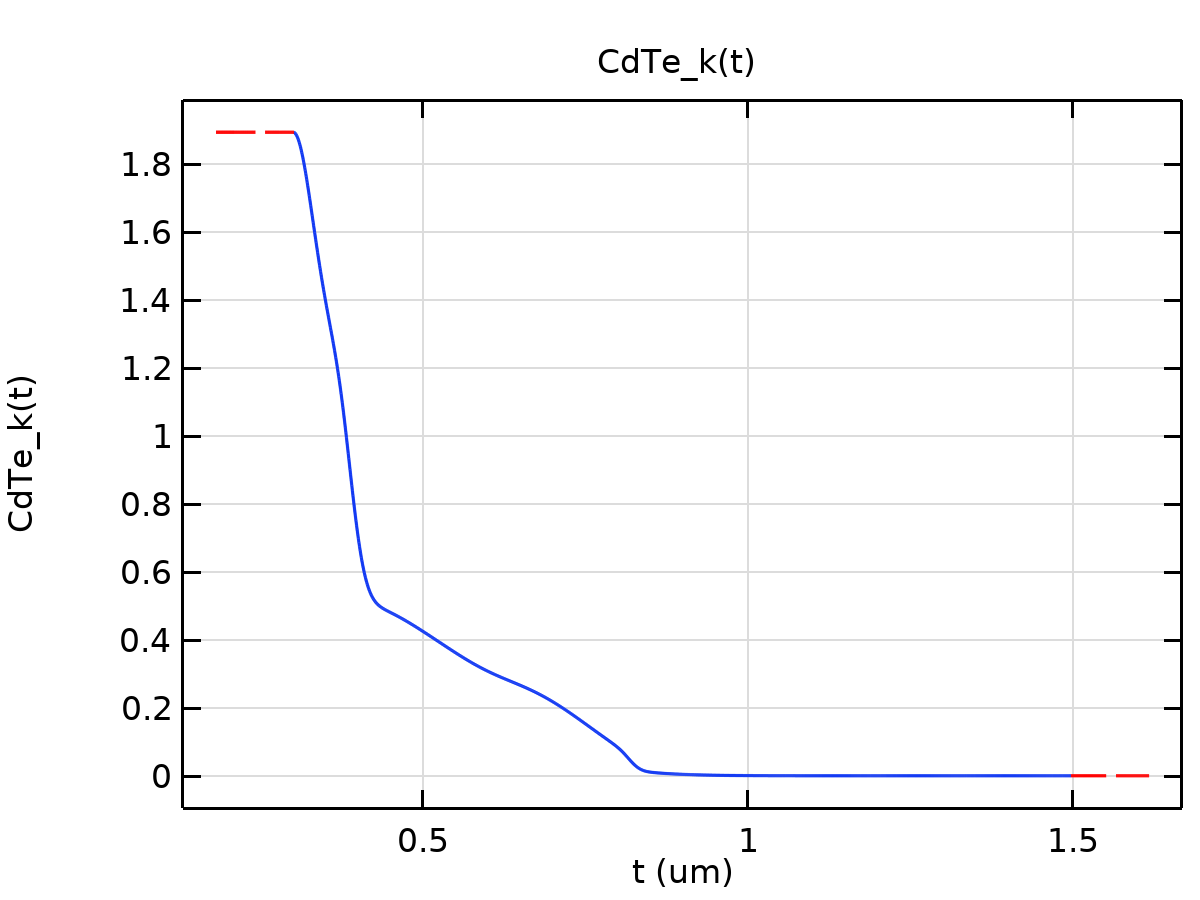
Interpolation 1

Units

| **Description** | **Value** |
| --- | --- |
| Arguments | um |

#### Interpolation 2

|  |  |
| --- | --- |
| Function names | CdTe\_k |
| Function type | Interpolation |



Interpolation 2

Units

| **Description** | **Value** |
| --- | --- |
| Arguments | um |

* + 1. Selections

#### nanoparticle\_surface

| **Selection type** |
| --- |
| Explicit |

| **Selection** |
| --- |
| Boundaries 67–72 |

#### nanoparticle

| **Selection type** |
| --- |
| Explicit |

| **Selection** |
| --- |
| Domain 19 |

#### Physical Domain

| **Selection type** |
| --- |
| Explicit |

| **Selection** |
| --- |
| Domains 14, 19 |

#### PML

| **Selection type** |
| --- |
| Complement |

| **Selection** |
| --- |
| Domains 1–13, 15–18, 20–28 |

Geometric entity level

| **Description** | **Value** |
| --- | --- |
| Level | Domain |

Input entities

| **Description** | **Value** |
| --- | --- |
| Selections to invert | Physical Domain |

#### Explicit 1

| **Selection type** |
| --- |
| Explicit |

| **Selection** |
| --- |
| Boundary 86 |

#### Explicit 2

| **Selection type** |
| --- |
| Explicit |

| **Selection** |
| --- |
| Boundary 58 |

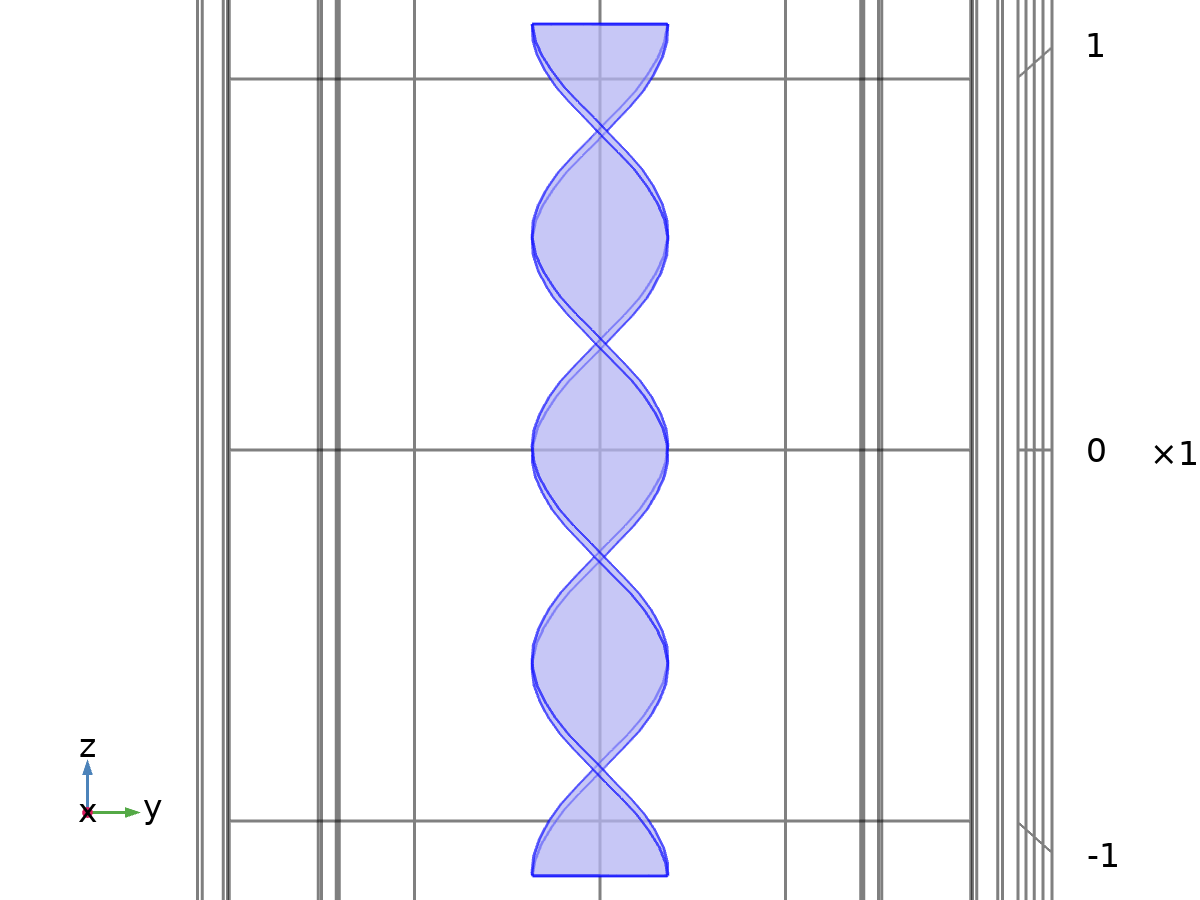
* + 1. Nonlocal Couplings

#### Integration 1

|  |  |
| --- | --- |
| Coupling type | Integration |
| Operator name | intop00 |

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Name | nanoparticle |
| Selection | Named sel2: Geometry geom1: Dimension 3: Domain 19 |



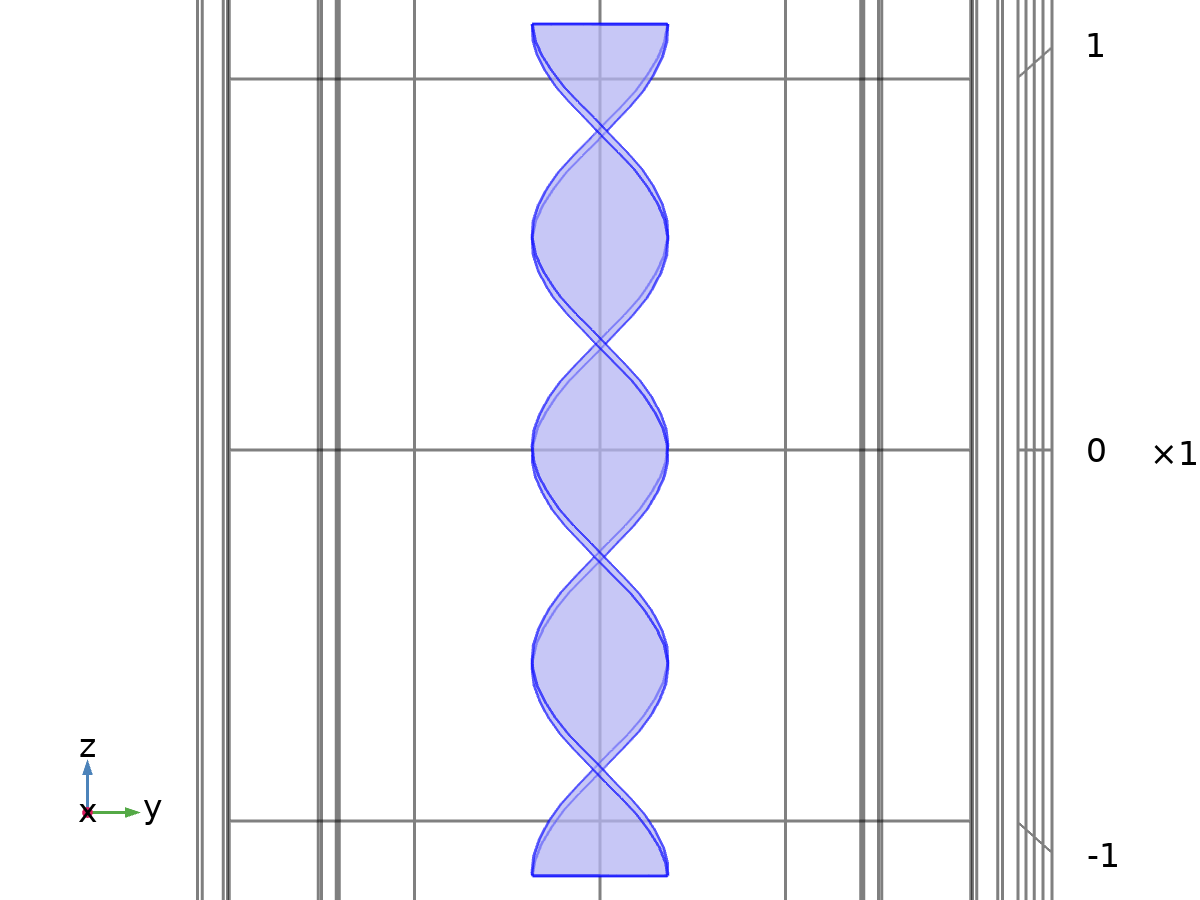
Selection

#### Integration 2

|  |  |
| --- | --- |
| Coupling type | Integration |
| Operator name | intop01 |

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Name | nanoparticle surface |
| Selection | Named sel1: Geometry geom1: Dimension 2: Boundaries 67–72 |



Selection

* + 1. Coordinate Systems

#### Boundary System 1

|  |  |
| --- | --- |
| Coordinate system type | Boundary system |
| Tag | sys1 |

Coordinate names

| **First** | **Second** | **Third** |
| --- | --- | --- |
| t1 | t2 | n |

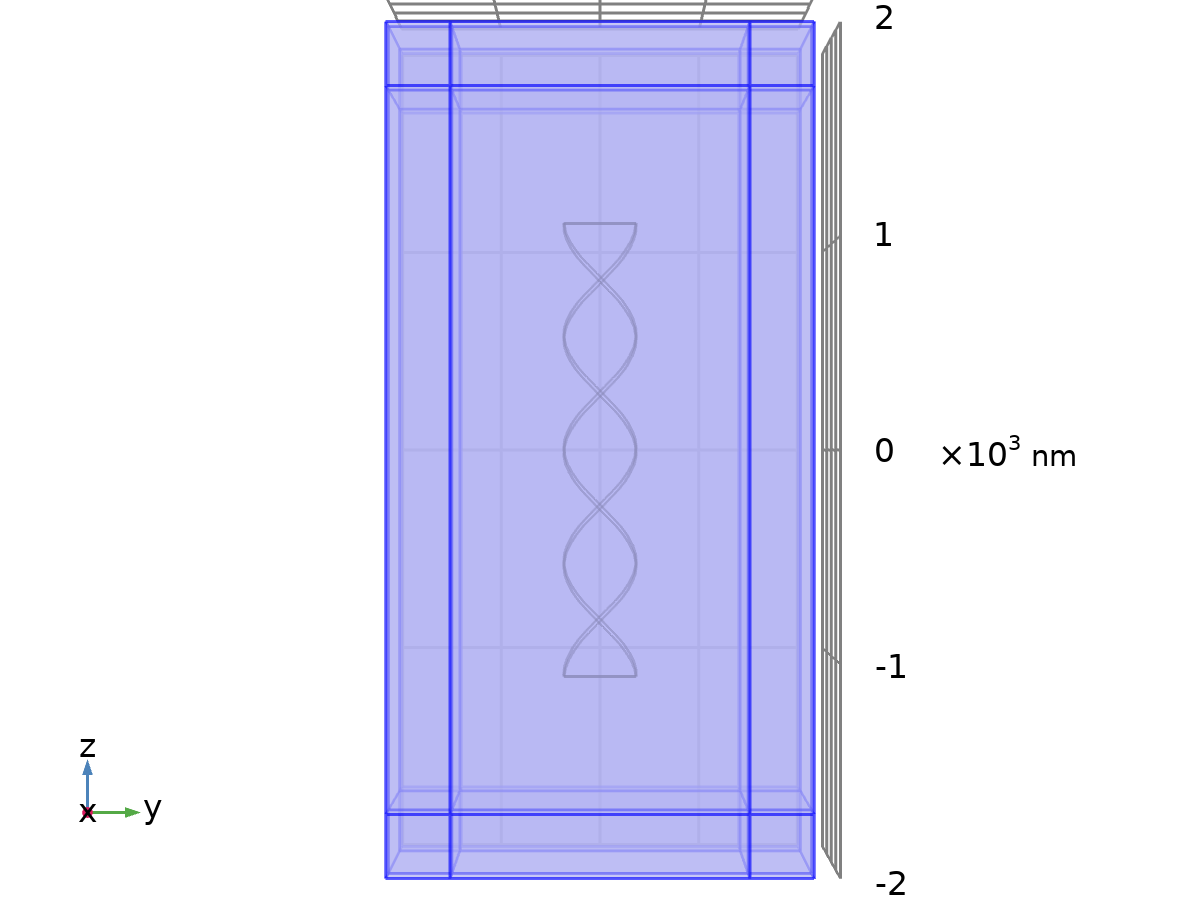
* + 1. Artificial Domains

#### Perfectly Matched Layer 1

|  |  |
| --- | --- |
| Tag | pml1 |

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Name | PML |
| Selection | Named com1: Geometry geom1: Dimension 3: Domains 1–13, 15–18, 20–28 |



Selection

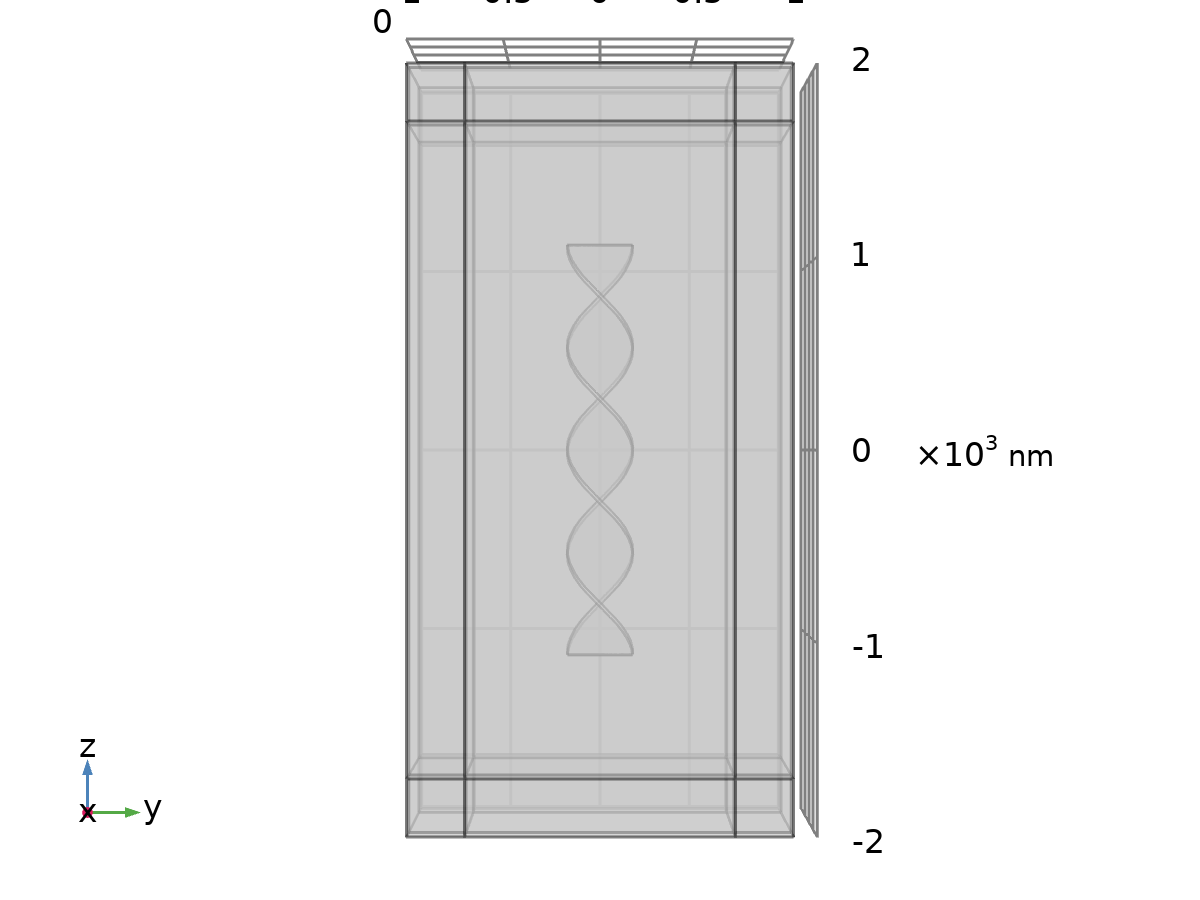
Geometry

| **Description** | **Value** |
| --- | --- |
| Coordinate names | {x, y, z} |
| Type | Cartesian |

Scaling

| **Description** | **Value** |
| --- | --- |
| Coordinate stretching type | Polynomial |
| Typical wavelength from | Physics interface |
| Physics | [Electromagnetic Waves, Frequency Domain 2a](#cs2252149) |

* 1. Geometry 1



Geometry 1

Units

|  |  |
| --- | --- |
| Length unit | nm |
| Angular unit | deg |

Geometry statistics

| **Description** | **Value** |
| --- | --- |
| Space dimension | 3 |
| Number of domains | 28 |
| Number of boundaries | 114 |
| Number of edges | 156 |
| Number of vertices | 72 |

* + 1. Import 1 (imp1)

Settings

| **Description** | **Value** |
| --- | --- |
| Source | COMSOL Multiphysics file |
| Filename | R:\550p\_350w\_25t.mphbin |

* + 1. Block 1 (blk1)

Position

| **Description** | **Value** |
| --- | --- |
| Position | {0, 0, 0} |
| Base | Center |

Axis

| **Description** | **Value** |
| --- | --- |
| Axis type | z - axis |

Size and shape

| **Description** | **Value** |
| --- | --- |
| Width | a |
| Depth | a |
| Height | b |

Layers

| **Layer name** | **Thickness (nm)** |
| --- | --- |
| Layer 1 | pml\_t |

Layers

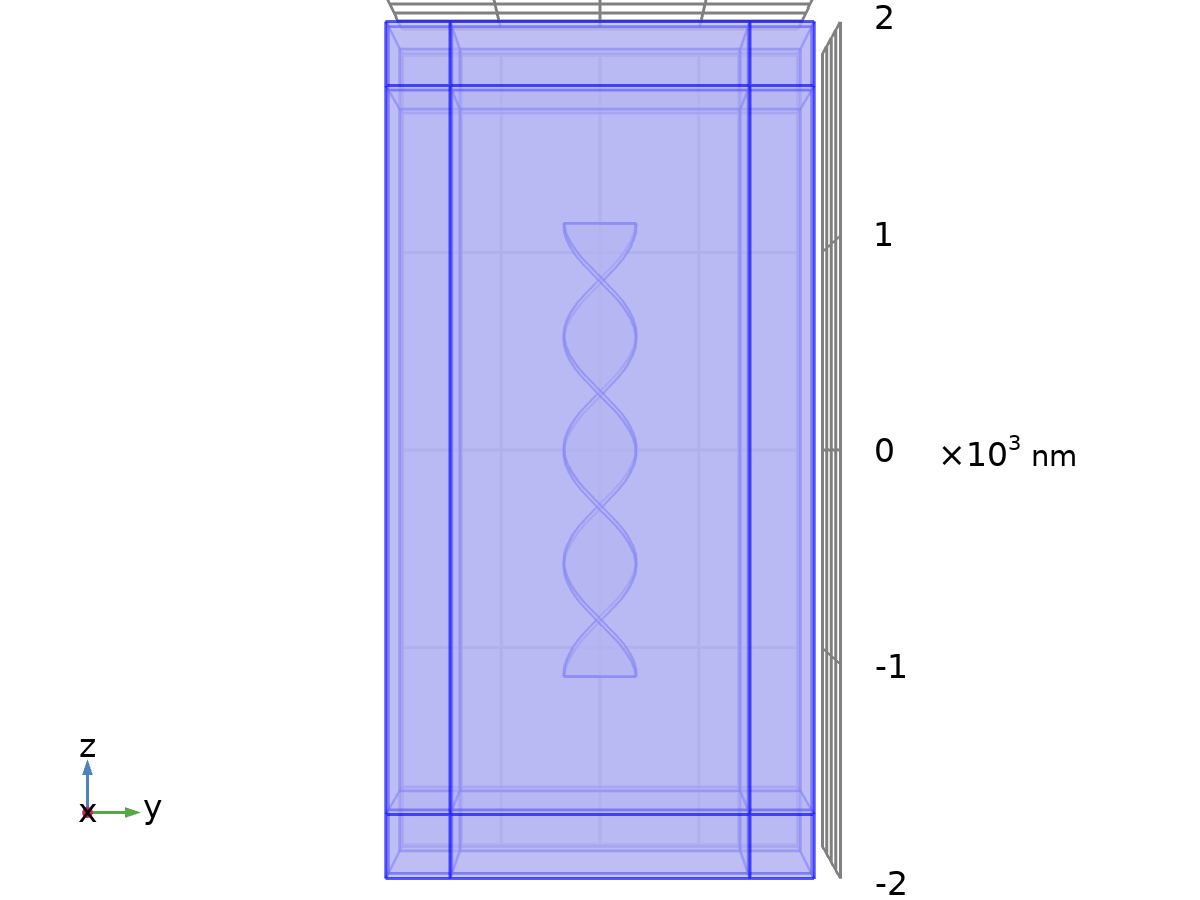
| **Description** | **Value** |
| --- | --- |
| Left | On |
| Right | On |
| Front | On |
| Back | On |
| Top | On |

* + 1. Rotate 2 (rot2)

Settings

| **Description** | **Value** |
| --- | --- |
| Point on axis of rotation | {0, 0, 0} |
| Axis type | y - axis |
| Angle | 90 |

* 1. Materials
     1. Water, liquid



Water, liquid

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

Material parameters

| **Name** | **Value** | **Unit** |
| --- | --- | --- |
| Refractive index, real part | 1.33 | 1 |
| Refractive index, imaginary part | 0 | 1 |

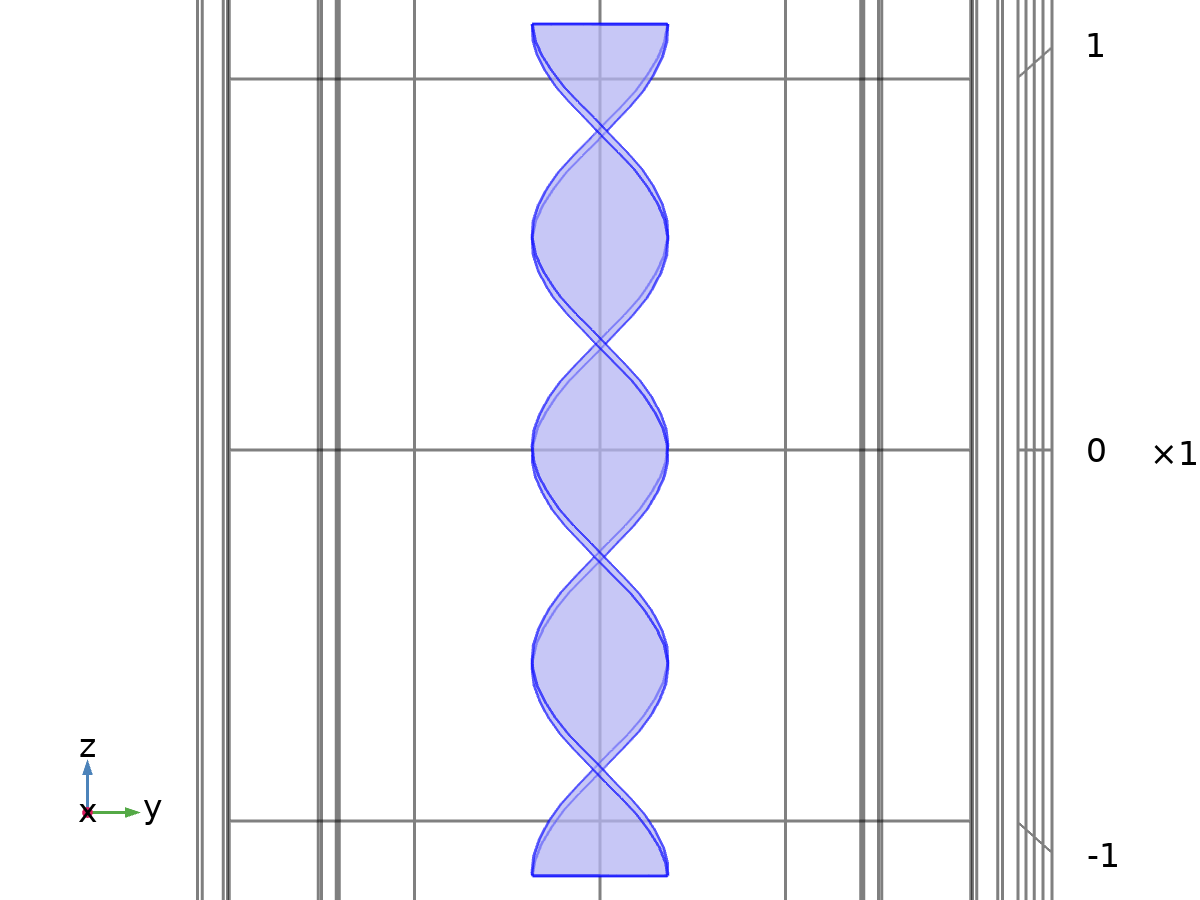
Basic

| **Description** | **Value** |
| --- | --- |
| Dynamic viscosity | eta(T[1/K])[Pa\*s] |
| Ratio of specific heats | 1.0 |
| Electrical conductivity | {{5.5e-6[S/m], 0, 0}, {0, 5.5e-6[S/m], 0}, {0, 0, 5.5e-6[S/m]}} |
| Heat capacity at constant pressure | Cp(T[1/K])[J/(kg\*K)] |
| Density | rho(T[1/K])[kg/m^3] |
| Thermal conductivity | {{k(T[1/K])[W/(m\*K)], 0, 0}, {0, k(T[1/K])[W/(m\*K)], 0}, {0, 0, k(T[1/K])[W/(m\*K)]}} |
| Speed of sound | cs(T[1/K])[m/s] |

Refractive index

| **Description** | **Value** |
| --- | --- |
| Refractive index, real part | {{1.33, 0, 0}, {0, 1.33, 0}, {0, 0, 1.33}} |
| Refractive index, imaginary part | {{0, 0, 0}, {0, 0, 0}, {0, 0, 0}} |

* + 1. CdTe



CdTe

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domain 19 |

Material parameters

| **Name** | **Value** | **Unit** |
| --- | --- | --- |
| Refractive index, real part | CdTe\_n(wl) | 1 |
| Refractive index, imaginary part | CdTe\_k(wl) | 1 |

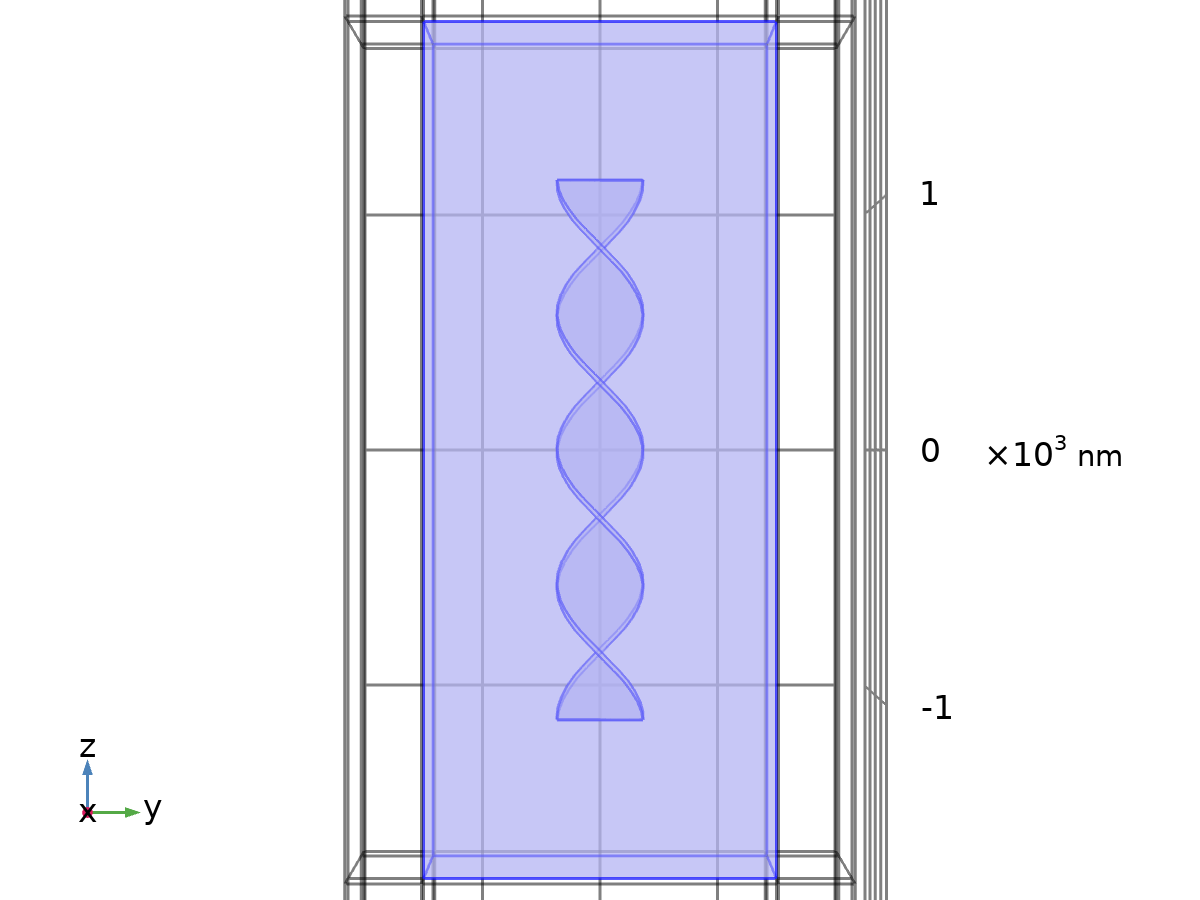
Refractive index

| **Description** | **Value** |
| --- | --- |
| Refractive index, real part | {{CdTe\_n(wl), 0, 0}, {0, CdTe\_n(wl), 0}, {0, 0, CdTe\_n(wl)}} |
| Refractive index, imaginary part | {{CdTe\_k(wl), 0, 0}, {0, CdTe\_k(wl), 0}, {0, 0, CdTe\_k(wl)}} |

* 1. Electromagnetic Waves, Frequency Domain 2

Used products

|  |
| --- |
| COMSOL Multiphysics |
| Wave Optics Module |

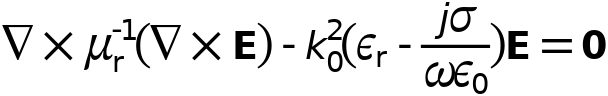


Electromagnetic Waves, Frequency Domain 2

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Name | Physical Domain |
| Selection | Named sel3: Geometry geom1: Dimension 3: Domains 14, 19 |

Equations



* + 1. Interface Settings

#### Discretization

Settings

| **Description** | **Value** |
| --- | --- |
| Electric field | Quadratic |

#### Formulation

Settings

| **Description** | **Value** |
| --- | --- |
|  | Full field |

#### Port Sweep Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Use manual port sweep | Off |

#### Physics-Controlled Mesh

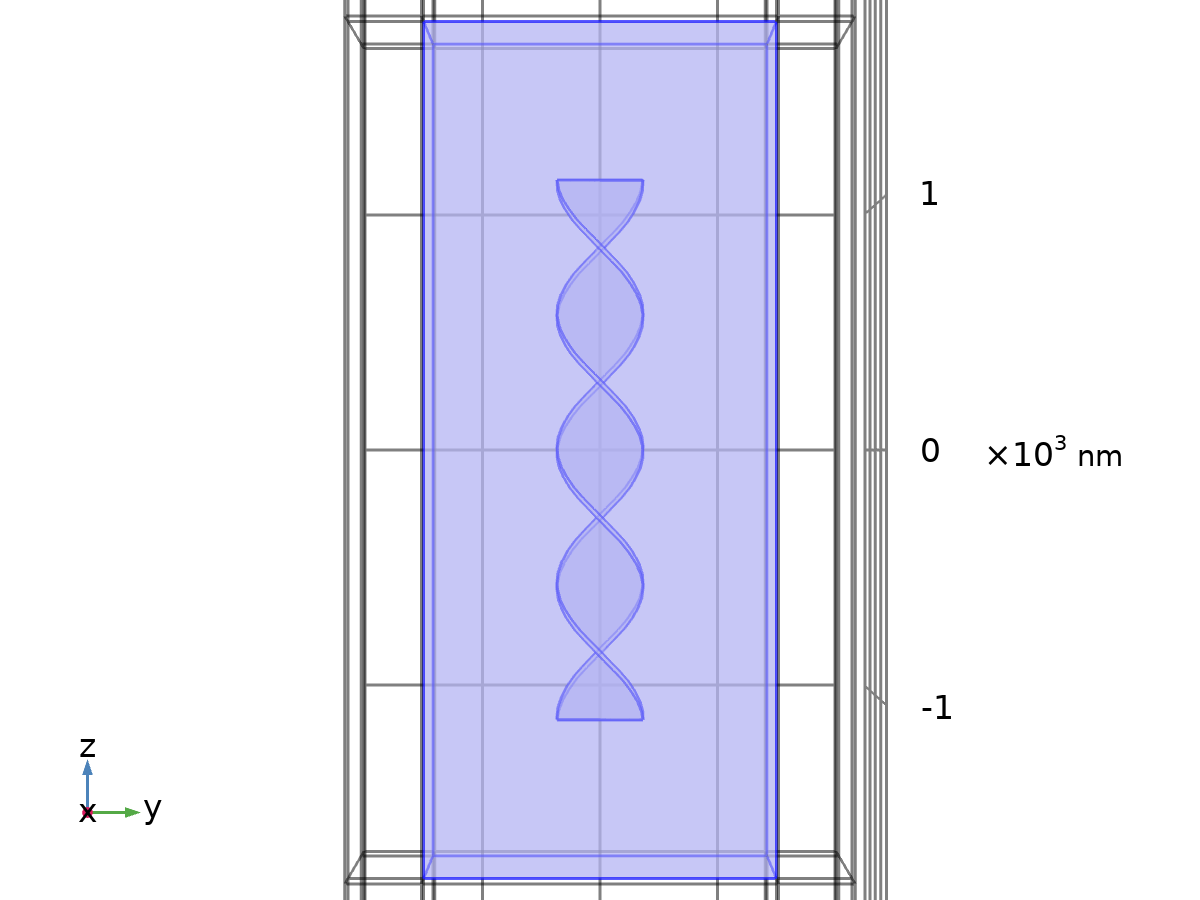
Settings

| **Description** | **Value** |
| --- | --- |
| Maximum mesh element size control parameter | From study |
| Resolve wave in lossy media | Off |

* + 1. Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd.Ebx | 0 | V/m | Background electric field, x component | Domains 14, 19 |  |
| ewfd.Eby | 0 | V/m | Background electric field, y component | Domains 14, 19 |  |
| ewfd.Ebz | 0 | V/m | Background electric field, z component | Domains 14, 19 |  |
| ewfd.curlEbx | d(ewfd.Ebz,y)-d(ewfd.Eby,z) | V/m² | Curl of background electric field, x component | Domains 14, 19 |  |
| ewfd.curlEby | -d(ewfd.Ebz,x)+d(ewfd.Ebx,z) | V/m² | Curl of background electric field, y component | Domains 14, 19 |  |
| ewfd.curlEbz | d(ewfd.Eby,x)-d(ewfd.Ebx,y) | V/m² | Curl of background electric field, z component | Domains 14, 19 |  |
| ewfd.k0 | ewfd.iomega\*sqrt(mu0\_const\*epsilon0\_const)/i | rad/m | Wave number in free space | Global |  |
| ewfd.k | ewfd.k0\*sqrt((ewfd.murxx\*(ewfd.epsilonrxx+ewfd.sigmaxx/(ewfd.iomega\*epsilon0\_const))+ewfd.murxy\*(ewfd.epsilonryx+ewfd.sigmayx/(ewfd.iomega\*epsilon0\_const))+ewfd.murxz\*(ewfd.epsilonrzx+ewfd.sigmazx/(ewfd.iomega\*epsilon0\_const))+ewfd.muryx\*(ewfd.epsilonrxy+ewfd.sigmaxy/(ewfd.iomega\*epsilon0\_const))+ewfd.muryy\*(ewfd.epsilonryy+ewfd.sigmayy/(ewfd.iomega\*epsilon0\_const))+ewfd.muryz\*(ewfd.epsilonrzy+ewfd.sigmazy/(ewfd.iomega\*epsilon0\_const))+ewfd.murzx\*(ewfd.epsilonrxz+ewfd.sigmaxz/(ewfd.iomega\*epsilon0\_const))+ewfd.murzy\*(ewfd.epsilonryz+ewfd.sigmayz/(ewfd.iomega\*epsilon0\_const))+ewfd.murzz\*(ewfd.epsilonrzz+ewfd.sigmazz/(ewfd.iomega\*epsilon0\_const)))/3) | rad/m | Wave number | Domains 14, 19 |  |
| ewfd.Jsx | 0 | A/m | Surface current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Jsy | 0 | A/m | Surface current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Jsz | 0 | A/m | Surface current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.normJs | sqrt(realdot(ewfd.Jsx,ewfd.Jsx)+realdot(ewfd.Jsy,ewfd.Jsy)+realdot(ewfd.Jsz,ewfd.Jsz)) | A/m | Surface current density norm | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.intWe | ewfd.integratewee(ewfd.dWe) | J | Total electric energy | Global | + operation |
| ewfd.intWm | ewfd.integratewee(ewfd.dWm) | J | Total magnetic energy | Global | + operation |
| ewfd.lambda0 | lambda0 | m | Wavelength in free space | Global |  |
| ewfd.freq | c\_const/ewfd.lambda0 | Hz | Frequency | Global |  |
| ewfd.nx | unx |  | Normal vector, x component | Boundaries 52, 58, 86 |  |
| ewfd.ny | uny |  | Normal vector, y component | Boundaries 52, 58, 86 |  |
| ewfd.nz | unz |  | Normal vector, z component | Boundaries 52, 58, 86 |  |
| ewfd.nx | dnx |  | Normal vector, x component | Boundaries 47–49 |  |
| ewfd.ny | dny |  | Normal vector, y component | Boundaries 47–49 |  |
| ewfd.nz | dnz |  | Normal vector, z component | Boundaries 47–49 |  |
| ewfd.nx | nx |  | Normal vector, x component | Boundaries 67–72 |  |
| ewfd.ny | ny |  | Normal vector, y component | Boundaries 67–72 |  |
| ewfd.nz | nz |  | Normal vector, z component | Boundaries 67–72 |  |
| ewfd.nPMLx | unx | 1 | Normal vector, x component | Boundaries 52, 58, 86 |  |
| ewfd.nPMLy | uny | 1 | Normal vector, y component | Boundaries 52, 58, 86 |  |
| ewfd.nPMLz | unz | 1 | Normal vector, z component | Boundaries 52, 58, 86 |  |
| ewfd.nPMLx | dnx | 1 | Normal vector, x component | Boundaries 47–49 |  |
| ewfd.nPMLy | dny | 1 | Normal vector, y component | Boundaries 47–49 |  |
| ewfd.nPMLz | dnz | 1 | Normal vector, z component | Boundaries 47–49 |  |
| ewfd.nPMLx | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd.unx+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd.dnx+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd.nx | 1 | Normal vector, x component | Boundaries 67–72 |  |
| ewfd.nPMLy | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd.uny+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd.dny+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd.ny | 1 | Normal vector, y component | Boundaries 67–72 |  |
| ewfd.nPMLz | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd.unz+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd.dnz+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd.nz | 1 | Normal vector, z component | Boundaries 67–72 |  |
| ewfd.nmeshx | unxmesh |  | Normal vector (mesh), x component | Boundaries 52, 58, 86 |  |
| ewfd.nmeshy | unymesh |  | Normal vector (mesh), y component | Boundaries 52, 58, 86 |  |
| ewfd.nmeshz | unzmesh |  | Normal vector (mesh), z component | Boundaries 52, 58, 86 |  |
| ewfd.nmeshx | dnxmesh |  | Normal vector (mesh), x component | Boundaries 47–49 |  |
| ewfd.nmeshy | dnymesh |  | Normal vector (mesh), y component | Boundaries 47–49 |  |
| ewfd.nmeshz | dnzmesh |  | Normal vector (mesh), z component | Boundaries 47–49 |  |
| ewfd.nmeshx | nxmesh |  | Normal vector (mesh), x component | Boundaries 67–72 |  |
| ewfd.nmeshy | nymesh |  | Normal vector (mesh), y component | Boundaries 67–72 |  |
| ewfd.nmeshz | nzmesh |  | Normal vector (mesh), z component | Boundaries 67–72 |  |
| ewfd.unmeshx | unxmesh |  | Mesh normal vector, upside, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unmeshy | unymesh |  | Mesh normal vector, upside, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unmeshz | unzmesh |  | Mesh normal vector, upside, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnmeshx | dnxmesh |  | Mesh normal vector, downside, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnmeshy | dnymesh |  | Mesh normal vector, downside, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnmeshz | dnzmesh |  | Mesh normal vector, downside, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEx | ewfd.tEsdimx | V/m | Tangential electric field, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEy | ewfd.tEsdimy | V/m | Tangential electric field, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEz | ewfd.tEsdimz | V/m | Tangential electric field, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEx | ewfd.tEsdimx | V/m | Tangential electric field, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.tEy | ewfd.tEsdimy | V/m | Tangential electric field, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.tEz | ewfd.tEsdimz | V/m | Tangential electric field, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.tEsdimx | tE2x | V/m | Tangential electric field, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEsdimy | tE2y | V/m | Tangential electric field, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEsdimz | tE2z | V/m | Tangential electric field, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tEsdimx | tE2x | V/m | Tangential electric field, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.tEsdimy | tE2y | V/m | Tangential electric field, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.tEsdimz | tE2z | V/m | Tangential electric field, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd.omega | 2\*pi\*ewfd.freq | rad/s | Angular frequency | Global |  |
| ewfd.iomega | ewfd.omega\*i | rad/s | Complex angular frequency | Global |  |
| ewfd.Rtotal | ewfd.Rport\_1 | 1 | Total reflectance | Global | + operation |
| ewfd.Ttotal | ewfd.Tport\_2 | 1 | Total transmittance | Global | + operation |
| ewfd.RTtotal | ewfd.Rtotal+ewfd.Ttotal | 1 | Total reflectance and transmittance | Global | + operation |
| ewfd.Atotal | 1-ewfd.RTtotal | 1 | Absorptance | Global | + operation |
| ewfd.port1.Pin | P | W | Port input power | Boundary 52 |  |
| ewfd.port2.Pin | P | W | Port input power | Boundary 49 |  |
| ewfd.S11 | if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x\*exp(-j\*phase),0) | 1 | S11 | Global |  |
| ewfd.S21 | if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x\*exp(-j\*phase),0) | 1 | S21 | Global |  |
| ewfd.S11dB | 10\*log10(realdot(if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x\*exp(-j\*phase),0),if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x\*exp(-j\*phase),0))) | 1 | S11 | Global |  |
| ewfd.S21dB | 10\*log10(realdot(if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x\*exp(-j\*phase),0),if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x\*exp(-j\*phase),0))) | 1 | S21 | Global |  |
| ewfd.Rport\_1 | abs(if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x\*exp(-j\*phase),0))^2 | 1 | Reflectance, port 1 | Global |  |
| ewfd.Tport\_2 | abs(if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x\*exp(-j\*phase),0))^2 | 1 | Transmittance, port 2 | Global |  |
| ewfd.Rorder\_0\_0 | abs(if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x\*exp(-j\*phase),0))^2 | 1 | Reflectance, order [0,0] | Global |  |
| ewfd.Torder\_0\_0 | abs(if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x\*exp(-j\*phase),0))^2 | 1 | Transmittance, order [0,0] | Global |  |
| ewfd.zref | 50[ohm] | Ω | Reference impedance | Global |  |

* + 1. Wave Equation, Electric 1

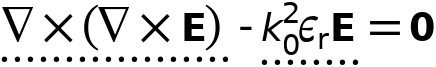


Wave Equation, Electric 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

Equations



#### Electric Displacement Field

Settings

| **Description** | **Value** |
| --- | --- |
| Electric displacement field model | Refractive index |
| Refractive index, real part | User defined |
| Refractive index, real part | {{1.33, 0, 0}, {0, 1.33, 0}, {0, 0, 1.33}} |
| Refractive index, imaginary part | User defined |
| Refractive index, imaginary part | {{0, 0, 0}, {0, 0, 0}, {0, 0, 0}} |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

#### Model Input

Settings

| **Description** | **Value** |
| --- | --- |
| Frequency | User defined |
| Frequency | root.freq |
| Temperature | User defined |
| Temperature | 293.15[K] |

#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd.Qsh | 0 | W/m² | Surface losses | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Qe | ewfd.Qml+ewfd.Qrh | W/m³ | Electromagnetic power loss density | Domains 14, 19 | + operation |
| ewfd.Qh | ewfd.Qml+ewfd.Qrh | W/m³ | Total power dissipation density | Domains 14, 19 | + operation |
| ewfd.Jx | ewfd.sigmaxx\*ewfd.Ex+ewfd.sigmaxy\*ewfd.Ey+ewfd.sigmaxz\*ewfd.Ez+ewfd.Jdx | A/m² | Current density, x component | Domains 14, 19 | + operation |
| ewfd.Jy | ewfd.sigmayx\*ewfd.Ex+ewfd.sigmayy\*ewfd.Ey+ewfd.sigmayz\*ewfd.Ez+ewfd.Jdy | A/m² | Current density, y component | Domains 14, 19 | + operation |
| ewfd.Jz | ewfd.sigmazx\*ewfd.Ex+ewfd.sigmazy\*ewfd.Ey+ewfd.sigmazz\*ewfd.Ez+ewfd.Jdz | A/m² | Current density, z component | Domains 14, 19 | + operation |
| ewfd.tJx | 0 | A/m² | Tangential current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.tJy | 0 | A/m² | Tangential current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.tJz | 0 | A/m² | Tangential current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Wav | ewfd.Weav+ewfd.Wmav | J/m³ | Energy density time average | Domains 14, 19 | + operation |
| ewfd.W | 0 | J/m³ | Energy density | Domains 14, 19 | + operation |
| ewfd.Jmsx | 0 | V/m | Surface magnetic current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Jmsy | 0 | V/m | Surface magnetic current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.Jmsz | 0 | V/m | Surface magnetic current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd.nxx | 1.33 | 1 | Refractive index, real part, xx component | Domains 14, 19 |  |
| ewfd.nyx | 0 | 1 | Refractive index, real part, yx component | Domains 14, 19 |  |
| ewfd.nzx | 0 | 1 | Refractive index, real part, zx component | Domains 14, 19 |  |
| ewfd.nxy | 0 | 1 | Refractive index, real part, xy component | Domains 14, 19 |  |
| ewfd.nyy | 1.33 | 1 | Refractive index, real part, yy component | Domains 14, 19 |  |
| ewfd.nzy | 0 | 1 | Refractive index, real part, zy component | Domains 14, 19 |  |
| ewfd.nxz | 0 | 1 | Refractive index, real part, xz component | Domains 14, 19 |  |
| ewfd.nyz | 0 | 1 | Refractive index, real part, yz component | Domains 14, 19 |  |
| ewfd.nzz | 1.33 | 1 | Refractive index, real part, zz component | Domains 14, 19 |  |
| ewfd.n\_iso | 1.33 | 1 | Refractive index, real part, isotropic value | Domains 14, 19 |  |
| ewfd.kixx | 0 | 1 | Refractive index, imaginary part, xx component | Domains 14, 19 |  |
| ewfd.kiyx | 0 | 1 | Refractive index, imaginary part, yx component | Domains 14, 19 |  |
| ewfd.kizx | 0 | 1 | Refractive index, imaginary part, zx component | Domains 14, 19 |  |
| ewfd.kixy | 0 | 1 | Refractive index, imaginary part, xy component | Domains 14, 19 |  |
| ewfd.kiyy | 0 | 1 | Refractive index, imaginary part, yy component | Domains 14, 19 |  |
| ewfd.kizy | 0 | 1 | Refractive index, imaginary part, zy component | Domains 14, 19 |  |
| ewfd.kixz | 0 | 1 | Refractive index, imaginary part, xz component | Domains 14, 19 |  |
| ewfd.kiyz | 0 | 1 | Refractive index, imaginary part, yz component | Domains 14, 19 |  |
| ewfd.kizz | 0 | 1 | Refractive index, imaginary part, zz component | Domains 14, 19 |  |
| ewfd.ki\_iso | 0 | 1 | Refractive index, imaginary part, isotropic value | Domains 14, 19 |  |
| ewfd.epsilonrxx | ewfd.epsilonrmxx | 1 | Relative permittivity, xx component | Domains 14, 19 |  |
| ewfd.epsilonryx | ewfd.epsilonrmyx | 1 | Relative permittivity, yx component | Domains 14, 19 |  |
| ewfd.epsilonrzx | ewfd.epsilonrmzx | 1 | Relative permittivity, zx component | Domains 14, 19 |  |
| ewfd.epsilonrxy | ewfd.epsilonrmxy | 1 | Relative permittivity, xy component | Domains 14, 19 |  |
| ewfd.epsilonryy | ewfd.epsilonrmyy | 1 | Relative permittivity, yy component | Domains 14, 19 |  |
| ewfd.epsilonrzy | ewfd.epsilonrmzy | 1 | Relative permittivity, zy component | Domains 14, 19 |  |
| ewfd.epsilonrxz | ewfd.epsilonrmxz | 1 | Relative permittivity, xz component | Domains 14, 19 |  |
| ewfd.epsilonryz | ewfd.epsilonrmyz | 1 | Relative permittivity, yz component | Domains 14, 19 |  |
| ewfd.epsilonrzz | ewfd.epsilonrmzz | 1 | Relative permittivity, zz component | Domains 14, 19 |  |
| ewfd.epsilonrmxx | (ewfd.nxx-i\*ewfd.kixx)^2+(ewfd.nxy-i\*ewfd.kixy)\*(ewfd.nyx-i\*ewfd.kiyx)+(ewfd.nxz-i\*ewfd.kixz)\*(ewfd.nzx-i\*ewfd.kizx) | 1 | Relative permittivity, xx component | Domains 14, 19 |  |
| ewfd.epsilonrmyx | (ewfd.nyx-i\*ewfd.kiyx)\*(ewfd.nxx-i\*ewfd.kixx)+(ewfd.nyy-i\*ewfd.kiyy)\*(ewfd.nyx-i\*ewfd.kiyx)+(ewfd.nyz-i\*ewfd.kiyz)\*(ewfd.nzx-i\*ewfd.kizx) | 1 | Relative permittivity, yx component | Domains 14, 19 |  |
| ewfd.epsilonrmzx | (ewfd.nzx-i\*ewfd.kizx)\*(ewfd.nxx-i\*ewfd.kixx)+(ewfd.nzy-i\*ewfd.kizy)\*(ewfd.nyx-i\*ewfd.kiyx)+(ewfd.nzz-i\*ewfd.kizz)\*(ewfd.nzx-i\*ewfd.kizx) | 1 | Relative permittivity, zx component | Domains 14, 19 |  |
| ewfd.epsilonrmxy | (ewfd.nxx-i\*ewfd.kixx)\*(ewfd.nxy-i\*ewfd.kixy)+(ewfd.nxy-i\*ewfd.kixy)\*(ewfd.nyy-i\*ewfd.kiyy)+(ewfd.nxz-i\*ewfd.kixz)\*(ewfd.nzy-i\*ewfd.kizy) | 1 | Relative permittivity, xy component | Domains 14, 19 |  |
| ewfd.epsilonrmyy | (ewfd.nyx-i\*ewfd.kiyx)\*(ewfd.nxy-i\*ewfd.kixy)+(ewfd.nyy-i\*ewfd.kiyy)^2+(ewfd.nyz-i\*ewfd.kiyz)\*(ewfd.nzy-i\*ewfd.kizy) | 1 | Relative permittivity, yy component | Domains 14, 19 |  |
| ewfd.epsilonrmzy | (ewfd.nzx-i\*ewfd.kizx)\*(ewfd.nxy-i\*ewfd.kixy)+(ewfd.nzy-i\*ewfd.kizy)\*(ewfd.nyy-i\*ewfd.kiyy)+(ewfd.nzz-i\*ewfd.kizz)\*(ewfd.nzy-i\*ewfd.kizy) | 1 | Relative permittivity, zy component | Domains 14, 19 |  |
| ewfd.epsilonrmxz | (ewfd.nxx-i\*ewfd.kixx)\*(ewfd.nxz-i\*ewfd.kixz)+(ewfd.nxy-i\*ewfd.kixy)\*(ewfd.nyz-i\*ewfd.kiyz)+(ewfd.nxz-i\*ewfd.kixz)\*(ewfd.nzz-i\*ewfd.kizz) | 1 | Relative permittivity, xz component | Domains 14, 19 |  |
| ewfd.epsilonrmyz | (ewfd.nyx-i\*ewfd.kiyx)\*(ewfd.nxz-i\*ewfd.kixz)+(ewfd.nyy-i\*ewfd.kiyy)\*(ewfd.nyz-i\*ewfd.kiyz)+(ewfd.nyz-i\*ewfd.kiyz)\*(ewfd.nzz-i\*ewfd.kizz) | 1 | Relative permittivity, yz component | Domains 14, 19 |  |
| ewfd.epsilonrmzz | (ewfd.nzx-i\*ewfd.kizx)\*(ewfd.nxz-i\*ewfd.kixz)+(ewfd.nzy-i\*ewfd.kizy)\*(ewfd.nyz-i\*ewfd.kiyz)+(ewfd.nzz-i\*ewfd.kizz)^2 | 1 | Relative permittivity, zz component | Domains 14, 19 |  |
| ewfd.Px | epsilon0\_const\*(ewfd.epsilonrxx\*ewfd.Ex+ewfd.epsilonrxy\*ewfd.Ey+ewfd.epsilonrxz\*ewfd.Ez-ewfd.Ex) | C/m² | Polarization, x component | Domains 14, 19 | + operation |
| ewfd.Py | epsilon0\_const\*(ewfd.epsilonryx\*ewfd.Ex+ewfd.epsilonryy\*ewfd.Ey+ewfd.epsilonryz\*ewfd.Ez-ewfd.Ey) | C/m² | Polarization, y component | Domains 14, 19 | + operation |
| ewfd.Pz | epsilon0\_const\*(ewfd.epsilonrzx\*ewfd.Ex+ewfd.epsilonrzy\*ewfd.Ey+ewfd.epsilonrzz\*ewfd.Ez-ewfd.Ez) | C/m² | Polarization, z component | Domains 14, 19 | + operation |
| ewfd.normP | sqrt(realdot(ewfd.Px,ewfd.Px)+realdot(ewfd.Py,ewfd.Py)+realdot(ewfd.Pz,ewfd.Pz)) | C/m² | Polarization norm | Domains 14, 19 |  |
| ewfd.Dx | epsilon0\_const\*ewfd.Ex+ewfd.Px | C/m² | Electric displacement field, x component | Domains 14, 19 | + operation |
| ewfd.Dy | epsilon0\_const\*ewfd.Ey+ewfd.Py | C/m² | Electric displacement field, y component | Domains 14, 19 | + operation |
| ewfd.Dz | epsilon0\_const\*ewfd.Ez+ewfd.Pz | C/m² | Electric displacement field, z component | Domains 14, 19 | + operation |
| ewfd.normD | sqrt(realdot(ewfd.Dx,ewfd.Dx)+realdot(ewfd.Dy,ewfd.Dy)+realdot(ewfd.Dz,ewfd.Dz)) | C/m² | Electric displacement field norm | Domains 14, 19 |  |
| ewfd.epsrAv | (ewfd.epsilonrxx+ewfd.epsilonryy+ewfd.epsilonrzz)/3 | 1 | Relative permittivity, average | Domains 14, 19 |  |
| ewfd.murxx | 1 | 1 | Relative permeability, xx component | Domains 14, 19 |  |
| ewfd.muryx | 0 | 1 | Relative permeability, yx component | Domains 14, 19 |  |
| ewfd.murzx | 0 | 1 | Relative permeability, zx component | Domains 14, 19 |  |
| ewfd.murxy | 0 | 1 | Relative permeability, xy component | Domains 14, 19 |  |
| ewfd.muryy | 1 | 1 | Relative permeability, yy component | Domains 14, 19 |  |
| ewfd.murzy | 0 | 1 | Relative permeability, zy component | Domains 14, 19 |  |
| ewfd.murxz | 0 | 1 | Relative permeability, xz component | Domains 14, 19 |  |
| ewfd.muryz | 0 | 1 | Relative permeability, yz component | Domains 14, 19 |  |
| ewfd.murzz | 1 | 1 | Relative permeability, zz component | Domains 14, 19 |  |
| ewfd.murAv | (ewfd.murxx+ewfd.muryy+ewfd.murzz)/3 | 1 | Relative permeability, average | Domains 14, 19 |  |
| ewfd.sigmaxx | 0 | S/m | Electrical conductivity, xx component | Domains 14, 19 |  |
| ewfd.sigmayx | 0 | S/m | Electrical conductivity, yx component | Domains 14, 19 |  |
| ewfd.sigmazx | 0 | S/m | Electrical conductivity, zx component | Domains 14, 19 |  |
| ewfd.sigmaxy | 0 | S/m | Electrical conductivity, xy component | Domains 14, 19 |  |
| ewfd.sigmayy | 0 | S/m | Electrical conductivity, yy component | Domains 14, 19 |  |
| ewfd.sigmazy | 0 | S/m | Electrical conductivity, zy component | Domains 14, 19 |  |
| ewfd.sigmaxz | 0 | S/m | Electrical conductivity, xz component | Domains 14, 19 |  |
| ewfd.sigmayz | 0 | S/m | Electrical conductivity, yz component | Domains 14, 19 |  |
| ewfd.sigmazz | 0 | S/m | Electrical conductivity, zz component | Domains 14, 19 |  |
| ewfd.Ex | E2x | V/m | Electric field, x component | Domains 14, 19 |  |
| ewfd.Ey | E2y | V/m | Electric field, y component | Domains 14, 19 |  |
| ewfd.Ez | E2z | V/m | Electric field, z component | Domains 14, 19 |  |
| ewfd.curlEx | curlE2x | V/m² | Curl of electric field, x component | Domains 14, 19 |  |
| ewfd.curlEy | curlE2y | V/m² | Curl of electric field, y component | Domains 14, 19 |  |
| ewfd.curlEz | curlE2z | V/m² | Curl of electric field, z component | Domains 14, 19 |  |
| ewfd.testdepEx | test(E2x) | V/m | Electric field, x component | Domains 14, 19 |  |
| ewfd.testdepEy | test(E2y) | V/m | Electric field, y component | Domains 14, 19 |  |
| ewfd.testdepEz | test(E2z) | V/m | Electric field, z component | Domains 14, 19 |  |
| ewfd.curltestdepEx | test(curlE2x) | V/m² | Curl of electric field, x component | Domains 14, 19 |  |
| ewfd.curltestdepEy | test(curlE2y) | V/m² | Curl of electric field, y component | Domains 14, 19 |  |
| ewfd.curltestdepEz | test(curlE2z) | V/m² | Curl of electric field, z component | Domains 14, 19 |  |
| ewfd.dBdtx | -ewfd.curlEx | V/m² | Magnetic flux density, time derivative, x component | Domains 14, 19 |  |
| ewfd.dBdty | -ewfd.curlEy | V/m² | Magnetic flux density, time derivative, y component | Domains 14, 19 |  |
| ewfd.dBdtz | -ewfd.curlEz | V/m² | Magnetic flux density, time derivative, z component | Domains 14, 19 |  |
| ewfd.Bx | -ewfd.curlEx/ewfd.iomega | T | Magnetic flux density, x component | Domains 14, 19 |  |
| ewfd.By | -ewfd.curlEy/ewfd.iomega | T | Magnetic flux density, y component | Domains 14, 19 |  |
| ewfd.Bz | -ewfd.curlEz/ewfd.iomega | T | Magnetic flux density, z component | Domains 14, 19 |  |
| ewfd.murinvxx | (ewfd.muryy\*ewfd.murzz-ewfd.muryz\*ewfd.murzy)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, xx component | Domains 14, 19 |  |
| ewfd.murinvyx | (ewfd.muryz\*ewfd.murzx-ewfd.muryx\*ewfd.murzz)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, yx component | Domains 14, 19 |  |
| ewfd.murinvzx | (ewfd.muryx\*ewfd.murzy-ewfd.muryy\*ewfd.murzx)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, zx component | Domains 14, 19 |  |
| ewfd.murinvxy | (ewfd.murxz\*ewfd.murzy-ewfd.murxy\*ewfd.murzz)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, xy component | Domains 14, 19 |  |
| ewfd.murinvyy | (ewfd.murxx\*ewfd.murzz-ewfd.murxz\*ewfd.murzx)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, yy component | Domains 14, 19 |  |
| ewfd.murinvzy | (ewfd.murxy\*ewfd.murzx-ewfd.murxx\*ewfd.murzy)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, zy component | Domains 14, 19 |  |
| ewfd.murinvxz | (ewfd.murxy\*ewfd.muryz-ewfd.murxz\*ewfd.muryy)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, xz component | Domains 14, 19 |  |
| ewfd.murinvyz | (ewfd.murxz\*ewfd.muryx-ewfd.murxx\*ewfd.muryz)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, yz component | Domains 14, 19 |  |
| ewfd.murinvzz | (ewfd.murxx\*ewfd.muryy-ewfd.murxy\*ewfd.muryx)/(ewfd.murxx\*ewfd.muryy\*ewfd.murzz+ewfd.murxy\*ewfd.muryz\*ewfd.murzx+ewfd.murxz\*ewfd.muryx\*ewfd.murzy-ewfd.murxx\*ewfd.muryz\*ewfd.murzy-ewfd.murxy\*ewfd.muryx\*ewfd.murzz-ewfd.murxz\*ewfd.muryy\*ewfd.murzx) | 1 | Inverse of relative permeability, zz component | Domains 14, 19 |  |
| ewfd.Hx | (ewfd.murinvxx\*ewfd.Bx+ewfd.murinvxy\*ewfd.By+ewfd.murinvxz\*ewfd.Bz)/mu0\_const | A/m | Magnetic field, x component | Domains 14, 19 |  |
| ewfd.Hy | (ewfd.murinvyx\*ewfd.Bx+ewfd.murinvyy\*ewfd.By+ewfd.murinvyz\*ewfd.Bz)/mu0\_const | A/m | Magnetic field, y component | Domains 14, 19 |  |
| ewfd.Hz | (ewfd.murinvzx\*ewfd.Bx+ewfd.murinvzy\*ewfd.By+ewfd.murinvzz\*ewfd.Bz)/mu0\_const | A/m | Magnetic field, z component | Domains 14, 19 |  |
| ewfd.dHdtx | (ewfd.murinvxx\*ewfd.dBdtx+ewfd.murinvxy\*ewfd.dBdty+ewfd.murinvxz\*ewfd.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, x component | Domains 14, 19 |  |
| ewfd.dHdty | (ewfd.murinvyx\*ewfd.dBdtx+ewfd.murinvyy\*ewfd.dBdty+ewfd.murinvyz\*ewfd.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, y component | Domains 14, 19 |  |
| ewfd.dHdtz | (ewfd.murinvzx\*ewfd.dBdtx+ewfd.murinvzy\*ewfd.dBdty+ewfd.murinvzz\*ewfd.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, z component | Domains 14, 19 |  |
| ewfd.normE | sqrt(realdot(ewfd.Ex,ewfd.Ex)+realdot(ewfd.Ey,ewfd.Ey)+realdot(ewfd.Ez,ewfd.Ez)) | V/m | Electric field norm | Domains 14, 19 |  |
| ewfd.normEi | sqrt(realdot(real(ewfd.Ex),real(ewfd.Ex))+realdot(real(ewfd.Ey),real(ewfd.Ey))+realdot(real(ewfd.Ez),real(ewfd.Ez))) | V/m | Instantaneous electric field norm | Domains 14, 19 |  |
| ewfd.Mx | ewfd.Bx/mu0\_const-ewfd.Hx | A/m | Magnetization, x component | Domains 14, 19 |  |
| ewfd.My | ewfd.By/mu0\_const-ewfd.Hy | A/m | Magnetization, y component | Domains 14, 19 |  |
| ewfd.Mz | ewfd.Bz/mu0\_const-ewfd.Hz | A/m | Magnetization, z component | Domains 14, 19 |  |
| ewfd.normM | sqrt(realdot(ewfd.Mx,ewfd.Mx)+realdot(ewfd.My,ewfd.My)+realdot(ewfd.Mz,ewfd.Mz)) | A/m | Magnetization norm | Domains 14, 19 |  |
| ewfd.Brx | 0 | T | Remanent flux density, x component | Domains 14, 19 |  |
| ewfd.Bry | 0 | T | Remanent flux density, y component | Domains 14, 19 |  |
| ewfd.Brz | 0 | T | Remanent flux density, z component | Domains 14, 19 |  |
| ewfd.normBr | sqrt(realdot(ewfd.Brx,ewfd.Brx)+realdot(ewfd.Bry,ewfd.Bry)+realdot(ewfd.Brz,ewfd.Brz)) | T | Remanent flux density norm | Domains 14, 19 |  |
| ewfd.Qml | real(0.5\*ewfd.iomega\*(ewfd.Bx\*conj(ewfd.Hx)+ewfd.By\*conj(ewfd.Hy)+ewfd.Bz\*conj(ewfd.Hz))) | W/m³ | Magnetic losses | Domains 14, 19 |  |
| ewfd.tBx | ewfd.Bx-(ewfd.nx\*ewfd.Bx+ewfd.ny\*ewfd.By+ewfd.nz\*ewfd.Bz)\*ewfd.nx | T | Tangential magnetic flux density, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tBy | ewfd.By-(ewfd.nx\*ewfd.Bx+ewfd.ny\*ewfd.By+ewfd.nz\*ewfd.Bz)\*ewfd.ny | T | Tangential magnetic flux density, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.tBz | ewfd.Bz-(ewfd.nx\*ewfd.Bx+ewfd.ny\*ewfd.By+ewfd.nz\*ewfd.Bz)\*ewfd.nz | T | Tangential magnetic flux density, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.normB | sqrt(realdot(ewfd.Bx,ewfd.Bx)+realdot(ewfd.By,ewfd.By)+realdot(ewfd.Bz,ewfd.Bz)) | T | Magnetic flux density norm | Domains 14, 19 |  |
| ewfd.normH | sqrt(realdot(ewfd.Hx,ewfd.Hx)+realdot(ewfd.Hy,ewfd.Hy)+realdot(ewfd.Hz,ewfd.Hz)) | A/m | Magnetic field norm | Domains 14, 19 |  |
| ewfd.Jix | ewfd.sigmaxx\*ewfd.Ex+ewfd.sigmaxy\*ewfd.Ey+ewfd.sigmaxz\*ewfd.Ez | A/m² | Induced current density, x component | Domains 14, 19 | + operation |
| ewfd.Jiy | ewfd.sigmayx\*ewfd.Ex+ewfd.sigmayy\*ewfd.Ey+ewfd.sigmayz\*ewfd.Ez | A/m² | Induced current density, y component | Domains 14, 19 | + operation |
| ewfd.Jiz | ewfd.sigmazx\*ewfd.Ex+ewfd.sigmazy\*ewfd.Ey+ewfd.sigmazz\*ewfd.Ez | A/m² | Induced current density, z component | Domains 14, 19 | + operation |
| ewfd.Jdx | ewfd.iomega\*ewfd.Dx | A/m² | Displacement current density, x component | Domains 14, 19 |  |
| ewfd.Jdy | ewfd.iomega\*ewfd.Dy | A/m² | Displacement current density, y component | Domains 14, 19 |  |
| ewfd.Jdz | ewfd.iomega\*ewfd.Dz | A/m² | Displacement current density, z component | Domains 14, 19 |  |
| ewfd.normJ | sqrt(realdot(ewfd.Jx,ewfd.Jx)+realdot(ewfd.Jy,ewfd.Jy)+realdot(ewfd.Jz,ewfd.Jz)) | A/m² | Current density norm | Domains 14, 19 |  |
| ewfd.dWe | ewfd.Weav | J/m³ | Integrand for total electric energy | Domains 14, 19 | Meta |
| ewfd.Weav | 0.25\*(realdot(d(ewfd.freq\*ewfd.Dx,ewfd.freq),ewfd.Ex)+realdot(d(ewfd.freq\*ewfd.Dy,ewfd.freq),ewfd.Ey)+realdot(d(ewfd.freq\*ewfd.Dz,ewfd.freq),ewfd.Ez)) | J/m³ | Electric energy density time average | Domains 14, 19 | + operation |
| ewfd.Qrh | 0.5\*(realdot(ewfd.Jx,ewfd.Ex)+realdot(ewfd.Jy,ewfd.Ey)+realdot(ewfd.Jz,ewfd.Ez)) | W/m³ | Resistive losses | Domains 14, 19 | + operation |
| ewfd.dWm | ewfd.Wmav | J/m³ | Integrand for total magnetic energy | Domains 14, 19 | Meta |
| ewfd.Wmav | 0.25\*(realdot(mu0\_const\*(d(ewfd.freq\*ewfd.murxx,ewfd.freq)\*ewfd.Hx+d(ewfd.freq\*ewfd.murxy,ewfd.freq)\*ewfd.Hy+d(ewfd.freq\*ewfd.murxz,ewfd.freq)\*ewfd.Hz),ewfd.Hx)+realdot(mu0\_const\*(d(ewfd.freq\*ewfd.muryx,ewfd.freq)\*ewfd.Hx+d(ewfd.freq\*ewfd.muryy,ewfd.freq)\*ewfd.Hy+d(ewfd.freq\*ewfd.muryz,ewfd.freq)\*ewfd.Hz),ewfd.Hy)+realdot(mu0\_const\*(d(ewfd.freq\*ewfd.murzx,ewfd.freq)\*ewfd.Hx+d(ewfd.freq\*ewfd.murzy,ewfd.freq)\*ewfd.Hy+d(ewfd.freq\*ewfd.murzz,ewfd.freq)\*ewfd.Hz),ewfd.Hz)) | J/m³ | Magnetic energy density time average | Domains 14, 19 |  |
| ewfd.Poavx | 0.5\*real(conj(ewfd.Hz)\*ewfd.Ey-conj(ewfd.Hy)\*ewfd.Ez) | W/m² | Power flow, time average, x component | Domains 14, 19 |  |
| ewfd.Poavy | 0.5\*real(-conj(ewfd.Hz)\*ewfd.Ex+conj(ewfd.Hx)\*ewfd.Ez) | W/m² | Power flow, time average, y component | Domains 14, 19 |  |
| ewfd.Poavz | 0.5\*real(conj(ewfd.Hy)\*ewfd.Ex-conj(ewfd.Hx)\*ewfd.Ey) | W/m² | Power flow, time average, z component | Domains 14, 19 |  |
| ewfd.nPoav | ewfd.Poavx\*ewfd.nPMLx+ewfd.Poavy\*ewfd.nPMLy+ewfd.Poavz\*ewfd.nPMLz | W/m² | Power outflow, time average | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.deltaS | 1/real(sqrt(ewfd.iomega\*mu0\_const\*(ewfd.murxx+ewfd.muryy+ewfd.murzz)\*(ewfd.sigmaxx+ewfd.sigmayy+ewfd.sigmazz+ewfd.iomega\*epsilon0\_const\*(ewfd.epsilonrxx+ewfd.epsilonryy+ewfd.epsilonrzz))/9)) | m | Skin depth | Domains 14, 19 |  |
| ewfd.unTx | ewfd.unTmx+ewfd.unTex | Pa | Maxwell upward surface stress tensor, x component | Boundaries 67–72 | + operation |
| ewfd.unTy | ewfd.unTmy+ewfd.unTey | Pa | Maxwell upward surface stress tensor, y component | Boundaries 67–72 | + operation |
| ewfd.unTz | ewfd.unTmz+ewfd.unTez | Pa | Maxwell upward surface stress tensor, z component | Boundaries 67–72 | + operation |
| ewfd.unTx | ewfd.unTmx+ewfd.unTex | Pa | Maxwell upward surface stress tensor, x component | Boundaries 52, 58, 86 | + operation |
| ewfd.unTy | ewfd.unTmy+ewfd.unTey | Pa | Maxwell upward surface stress tensor, y component | Boundaries 52, 58, 86 | + operation |
| ewfd.unTz | ewfd.unTmz+ewfd.unTez | Pa | Maxwell upward surface stress tensor, z component | Boundaries 52, 58, 86 | + operation |
| ewfd.unTx | 0 | Pa | Maxwell upward surface stress tensor, x component | Boundaries 47–49 | + operation |
| ewfd.unTy | 0 | Pa | Maxwell upward surface stress tensor, y component | Boundaries 47–49 | + operation |
| ewfd.unTz | 0 | Pa | Maxwell upward surface stress tensor, z component | Boundaries 47–49 | + operation |
| ewfd.dnTx | ewfd.dnTmx+ewfd.dnTex | Pa | Maxwell downward surface stress tensor, x component | Boundaries 67–72 | + operation |
| ewfd.dnTy | ewfd.dnTmy+ewfd.dnTey | Pa | Maxwell downward surface stress tensor, y component | Boundaries 67–72 | + operation |
| ewfd.dnTz | ewfd.dnTmz+ewfd.dnTez | Pa | Maxwell downward surface stress tensor, z component | Boundaries 67–72 | + operation |
| ewfd.dnTx | ewfd.dnTmx+ewfd.dnTex | Pa | Maxwell downward surface stress tensor, x component | Boundaries 47–49 | + operation |
| ewfd.dnTy | ewfd.dnTmy+ewfd.dnTey | Pa | Maxwell downward surface stress tensor, y component | Boundaries 47–49 | + operation |
| ewfd.dnTz | ewfd.dnTmz+ewfd.dnTez | Pa | Maxwell downward surface stress tensor, z component | Boundaries 47–49 | + operation |
| ewfd.dnTx | 0 | Pa | Maxwell downward surface stress tensor, x component | Boundaries 52, 58, 86 | + operation |
| ewfd.dnTy | 0 | Pa | Maxwell downward surface stress tensor, y component | Boundaries 52, 58, 86 | + operation |
| ewfd.dnTz | 0 | Pa | Maxwell downward surface stress tensor, z component | Boundaries 52, 58, 86 | + operation |
| ewfd.unx | unx |  | Normal vector up direction, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.uny | uny |  | Normal vector up direction, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unz | unz |  | Normal vector up direction, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnx | dnx |  | Normal vector down direction, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dny | dny |  | Normal vector down direction, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnz | dnz |  | Normal vector down direction, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTmx | 0.5\*real(-0.5\*ewfd.dnx\*(up(ewfd.Bx)\*up(conj(ewfd.Hx))+up(ewfd.By)\*up(conj(ewfd.Hy))+up(ewfd.Bz)\*up(conj(ewfd.Hz)))+up(ewfd.Bx)\*(up(conj(ewfd.Hx))\*ewfd.dnx+up(conj(ewfd.Hy))\*ewfd.dny+up(conj(ewfd.Hz))\*ewfd.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTmy | 0.5\*real(-0.5\*ewfd.dny\*(up(ewfd.Bx)\*up(conj(ewfd.Hx))+up(ewfd.By)\*up(conj(ewfd.Hy))+up(ewfd.Bz)\*up(conj(ewfd.Hz)))+up(ewfd.By)\*(up(conj(ewfd.Hx))\*ewfd.dnx+up(conj(ewfd.Hy))\*ewfd.dny+up(conj(ewfd.Hz))\*ewfd.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTmz | 0.5\*real(-0.5\*ewfd.dnz\*(up(ewfd.Bx)\*up(conj(ewfd.Hx))+up(ewfd.By)\*up(conj(ewfd.Hy))+up(ewfd.Bz)\*up(conj(ewfd.Hz)))+up(ewfd.Bz)\*(up(conj(ewfd.Hx))\*ewfd.dnx+up(conj(ewfd.Hy))\*ewfd.dny+up(conj(ewfd.Hz))\*ewfd.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTmx | 0.5\*real(-0.5\*ewfd.unx\*(down(ewfd.Bx)\*down(conj(ewfd.Hx))+down(ewfd.By)\*down(conj(ewfd.Hy))+down(ewfd.Bz)\*down(conj(ewfd.Hz)))+down(ewfd.Bx)\*(down(conj(ewfd.Hx))\*ewfd.unx+down(conj(ewfd.Hy))\*ewfd.uny+down(conj(ewfd.Hz))\*ewfd.unz)) | Pa | Maxwell downward magnetic surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTmy | 0.5\*real(-0.5\*ewfd.uny\*(down(ewfd.Bx)\*down(conj(ewfd.Hx))+down(ewfd.By)\*down(conj(ewfd.Hy))+down(ewfd.Bz)\*down(conj(ewfd.Hz)))+down(ewfd.By)\*(down(conj(ewfd.Hx))\*ewfd.unx+down(conj(ewfd.Hy))\*ewfd.uny+down(conj(ewfd.Hz))\*ewfd.unz)) | Pa | Maxwell downward magnetic surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTmz | 0.5\*real(-0.5\*ewfd.unz\*(down(ewfd.Bx)\*down(conj(ewfd.Hx))+down(ewfd.By)\*down(conj(ewfd.Hy))+down(ewfd.Bz)\*down(conj(ewfd.Hz)))+down(ewfd.Bz)\*(down(conj(ewfd.Hx))\*ewfd.unx+down(conj(ewfd.Hy))\*ewfd.uny+down(conj(ewfd.Hz))\*ewfd.unz)) | Pa | Maxwell downward magnetic surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTex | 0.5\*real(-0.5\*ewfd.dnx\*(up(ewfd.Dx)\*up(conj(ewfd.Ex))+up(ewfd.Dy)\*up(conj(ewfd.Ey))+up(ewfd.Dz)\*up(conj(ewfd.Ez)))+up(ewfd.Dx)\*(up(conj(ewfd.Ex))\*ewfd.dnx+up(conj(ewfd.Ey))\*ewfd.dny+up(conj(ewfd.Ez))\*ewfd.dnz)) | Pa | Maxwell upward electric surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTey | 0.5\*real(-0.5\*ewfd.dny\*(up(ewfd.Dx)\*up(conj(ewfd.Ex))+up(ewfd.Dy)\*up(conj(ewfd.Ey))+up(ewfd.Dz)\*up(conj(ewfd.Ez)))+up(ewfd.Dy)\*(up(conj(ewfd.Ex))\*ewfd.dnx+up(conj(ewfd.Ey))\*ewfd.dny+up(conj(ewfd.Ez))\*ewfd.dnz)) | Pa | Maxwell upward electric surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.unTez | 0.5\*real(-0.5\*ewfd.dnz\*(up(ewfd.Dx)\*up(conj(ewfd.Ex))+up(ewfd.Dy)\*up(conj(ewfd.Ey))+up(ewfd.Dz)\*up(conj(ewfd.Ez)))+up(ewfd.Dz)\*(up(conj(ewfd.Ex))\*ewfd.dnx+up(conj(ewfd.Ey))\*ewfd.dny+up(conj(ewfd.Ez))\*ewfd.dnz)) | Pa | Maxwell upward electric surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTex | 0.5\*real(-0.5\*ewfd.unx\*(down(ewfd.Dx)\*down(conj(ewfd.Ex))+down(ewfd.Dy)\*down(conj(ewfd.Ey))+down(ewfd.Dz)\*down(conj(ewfd.Ez)))+down(ewfd.Dx)\*(down(conj(ewfd.Ex))\*ewfd.unx+down(conj(ewfd.Ey))\*ewfd.uny+down(conj(ewfd.Ez))\*ewfd.unz)) | Pa | Maxwell downward electric surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTey | 0.5\*real(-0.5\*ewfd.uny\*(down(ewfd.Dx)\*down(conj(ewfd.Ex))+down(ewfd.Dy)\*down(conj(ewfd.Ey))+down(ewfd.Dz)\*down(conj(ewfd.Ez)))+down(ewfd.Dy)\*(down(conj(ewfd.Ex))\*ewfd.unx+down(conj(ewfd.Ey))\*ewfd.uny+down(conj(ewfd.Ez))\*ewfd.unz)) | Pa | Maxwell downward electric surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.dnTez | 0.5\*real(-0.5\*ewfd.unz\*(down(ewfd.Dx)\*down(conj(ewfd.Ex))+down(ewfd.Dy)\*down(conj(ewfd.Ey))+down(ewfd.Dz)\*down(conj(ewfd.Ez)))+down(ewfd.Dz)\*(down(conj(ewfd.Ex))\*ewfd.unx+down(conj(ewfd.Ey))\*ewfd.uny+down(conj(ewfd.Ez))\*ewfd.unz)) | Pa | Maxwell downward electric surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd.epsilonr0xx | ewfd.epsilonrmxx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xx component | Domains 14, 19 |  |
| ewfd.epsilonr0yx | ewfd.epsilonrmyx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yx component | Domains 14, 19 |  |
| ewfd.epsilonr0zx | ewfd.epsilonrmzx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zx component | Domains 14, 19 |  |
| ewfd.epsilonr0xy | ewfd.epsilonrmxy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xy component | Domains 14, 19 |  |
| ewfd.epsilonr0yy | ewfd.epsilonrmyy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yy component | Domains 14, 19 |  |
| ewfd.epsilonr0zy | ewfd.epsilonrmzy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zy component | Domains 14, 19 |  |
| ewfd.epsilonr0xz | ewfd.epsilonrmxz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xz component | Domains 14, 19 |  |
| ewfd.epsilonr0yz | ewfd.epsilonrmyz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yz component | Domains 14, 19 |  |
| ewfd.epsilonr0zz | ewfd.epsilonrmzz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zz component | Domains 14, 19 |  |

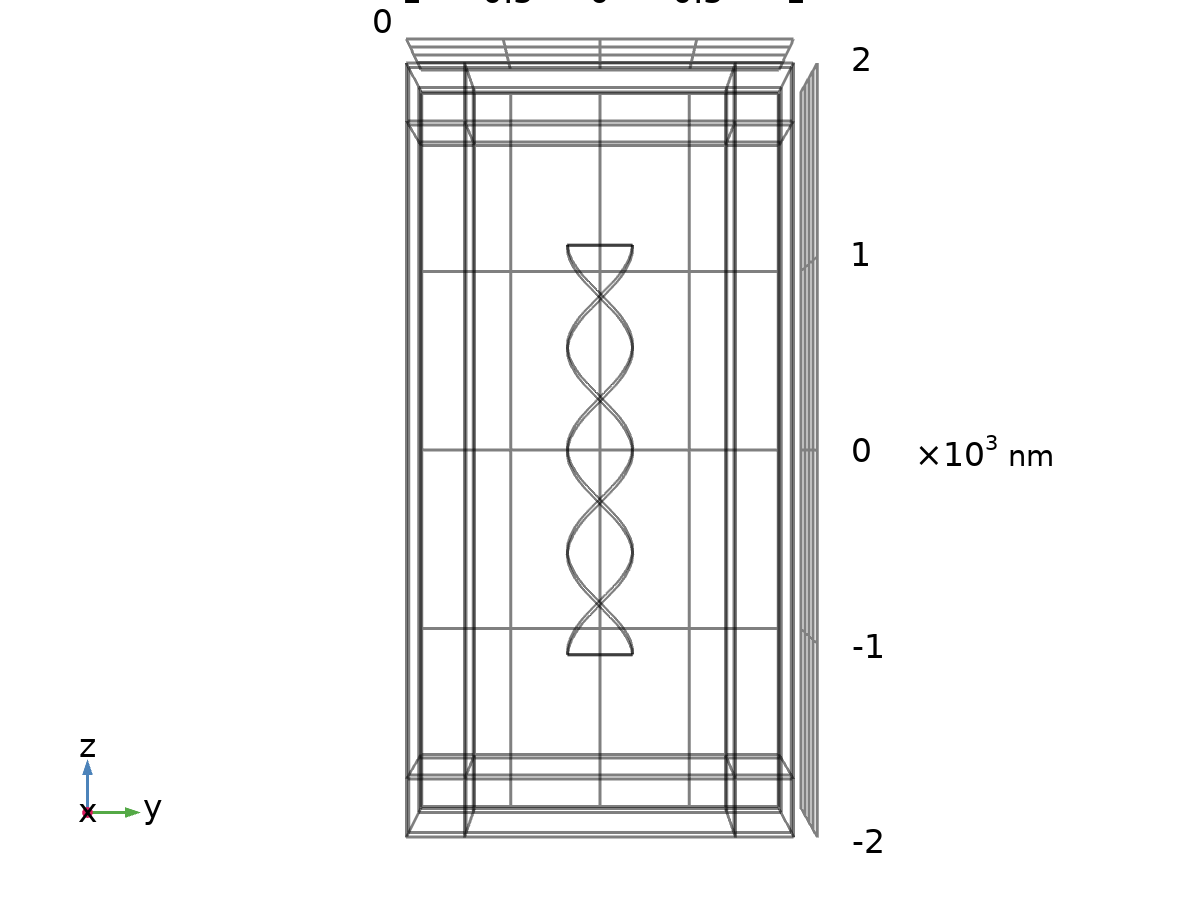
#### Shape functions

| **Name** | **Shape function** | **Unit** | **Description** | **Shape frame** | **Selection** |
| --- | --- | --- | --- | --- | --- |
| E2x | Curl (Quadratic) | V/m | Electric field, x component | Material | Domains 14, 19 |
| E2y | Curl (Quadratic) | V/m | Electric field, y component | Material | Domains 14, 19 |
| E2z | Curl (Quadratic) | V/m | Electric field, z component | Material | Domains 14, 19 |

#### Weak Expressions

| **Weak expression** | **Integration order** | **Integration frame** | **Selection** |
| --- | --- | --- | --- |
| -mu0\_const\*(-ewfd.dHdtx\*ewfd.curltestdepEx-ewfd.dHdty\*ewfd.curltestdepEy-ewfd.dHdtz\*ewfd.curltestdepEz+ewfd.iomega\*(ewfd.Jx\*ewfd.testdepEx+ewfd.Jy\*ewfd.testdepEy+ewfd.Jz\*ewfd.testdepEz)) | 4 | Material | Domains 14, 19 |

* + 1. Perfect Electric Conductor 1



Perfect Electric Conductor 1

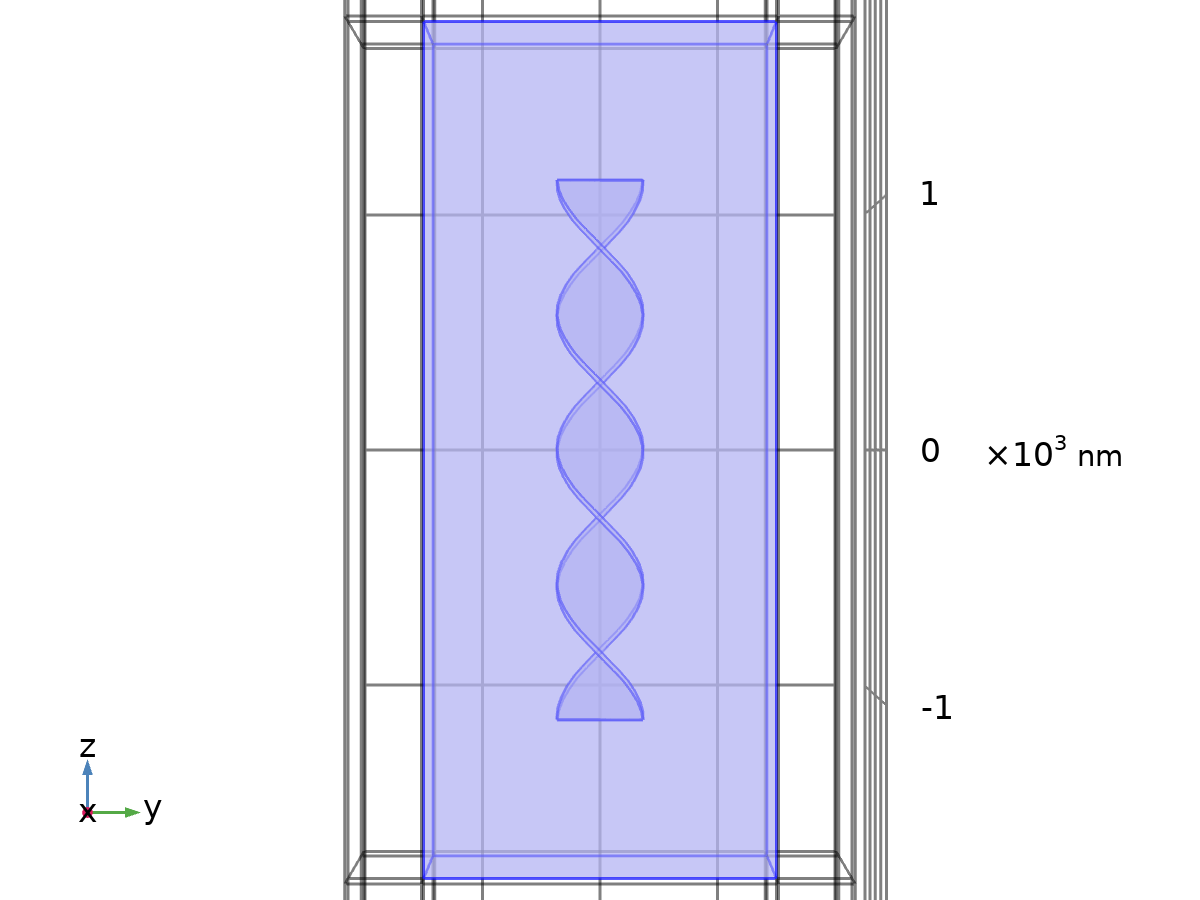
Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: All boundaries |

Equations



* + 1. Initial Values 1



Initial Values 1

Selection

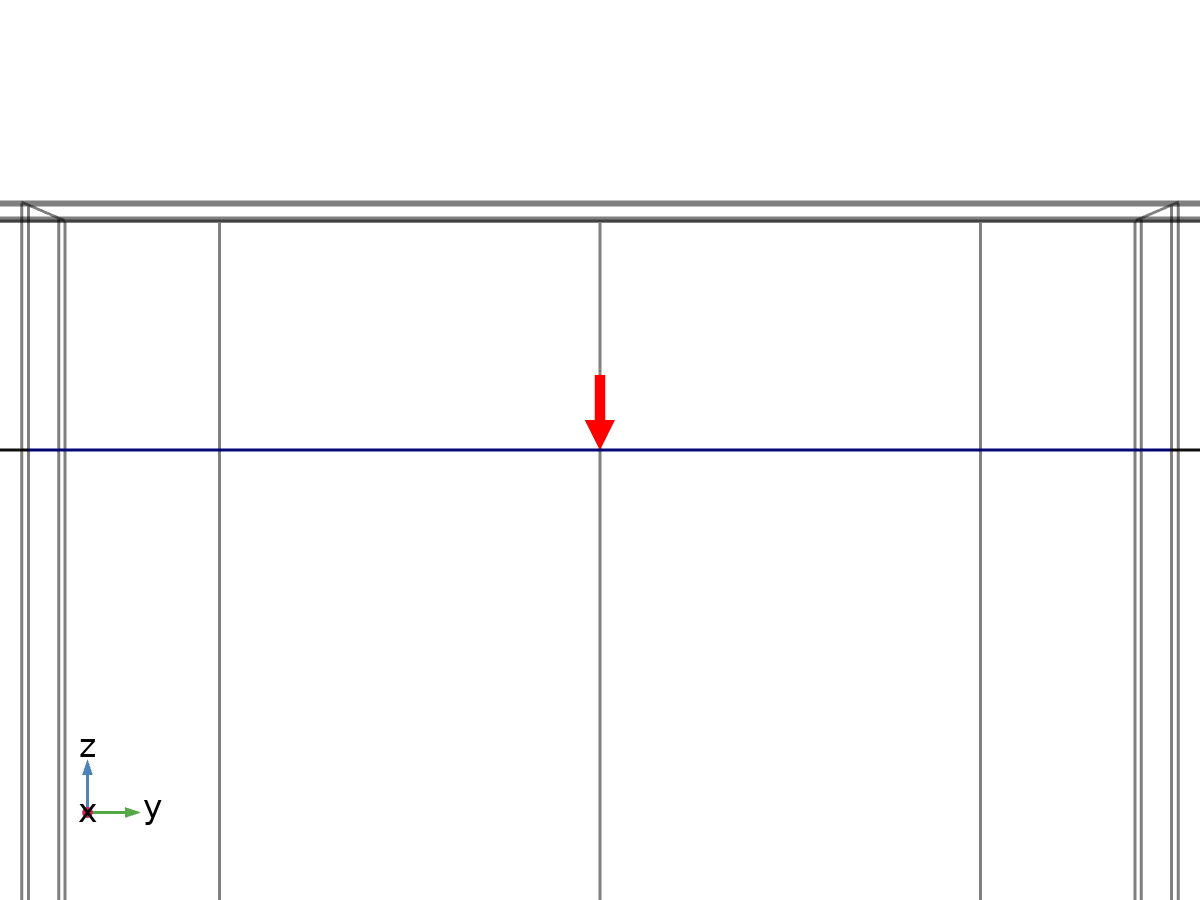
|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

* + 1. Port 1

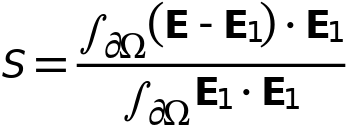


Port 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundary 52 |

Equations



#### Port Properties

Settings

| **Description** | **Value** |
| --- | --- |
| Port name | 1 |
| Type of port | Periodic |
| Wave excitation at this port | On |
| Port input power | P |
| Activate slit condition on interior port | Off |

#### Port Mode Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Input quantity | Electric field |
| Electric mode field amplitude | {1, c\*j, 0} |
| Elevation angle of incidence | 0 |
| Azimuth angle of incidence | 0 |
| Mode phase | 0 |

#### Automatic Diffraction Order Calculation

Settings

| **Description** | **Value** |
| --- | --- |
| Include in automatic diffraction order calculation | On |
| Refractive index, real part | {{1.33, 0, 0}, {0, 1.33, 0}, {0, 0, 1.33}} |
| Maximum frequency | From study |
| Add diffraction orders | 0 |

#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd.PortConstrx | nojac(ewfd.tEmodex\_1)\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0)) | V/m | Port constraint, x component | Boundary 52 | + operation |
| ewfd.PortConstry | nojac(ewfd.tEmodey\_1)\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0)) | V/m | Port constraint, y component | Boundary 52 | + operation |
| ewfd.PortConstrz | nojac(ewfd.tEmodez\_1)\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0)) | V/m | Port constraint, z component | Boundary 52 | + operation |
| ewfd.PortConstrx\_weak | test(nojac(conj(ewfd.tEmodex\_1))\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0))) | V/m | Port constraint, x component | Boundary 52 | + operation |
| ewfd.PortConstry\_weak | test(nojac(conj(ewfd.tEmodey\_1))\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0))) | V/m | Port constraint, y component | Boundary 52 | + operation |
| ewfd.PortConstrz\_weak | test(nojac(conj(ewfd.tEmodez\_1))\*(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0))) | V/m | Port constraint, z component | Boundary 52 | + operation |
| ewfd.kF | ewfd.k | rad/m | Wave number for Floquet periodicity | Boundary 52 |  |
| ewfd.Area\_1 | ewfd.intport1(1) | m² | Area | Global |  |
| ewfd.beta\_1 | ewfd.intport1(-ewfd.alphaport\_1\*j)/ewfd.Area\_1 | rad/m | Propagation constant | Global |  |
| ewfd.Pmode\_1 | ewfd.intport1(if(imag(ewfd.alphaport\_1)==0,1,0.5\*(ewfd.nx\*real(conj(ewfd.tH0modez\_1)\*ewfd.tE0modey\_1-conj(ewfd.tH0modey\_1)\*ewfd.tE0modez\_1)+ewfd.ny\*real(-conj(ewfd.tH0modez\_1)\*ewfd.tE0modex\_1+conj(ewfd.tH0modex\_1)\*ewfd.tE0modez\_1)+ewfd.nz\*real(conj(ewfd.tH0modey\_1)\*ewfd.tE0modex\_1-conj(ewfd.tH0modex\_1)\*ewfd.tE0modey\_1)))) | W | Port mode power | Global |  |
| ewfd.tEmodex\_1 | ewfd.tE0modex\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | V/m | Port tangential electric mode field, x component | Boundary 52 |  |
| ewfd.tEmodey\_1 | ewfd.tE0modey\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | V/m | Port tangential electric mode field, y component | Boundary 52 |  |
| ewfd.tEmodez\_1 | ewfd.tE0modez\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | V/m | Port tangential electric mode field, z component | Boundary 52 |  |
| ewfd.normtEmode\_1 | sqrt(realdot(ewfd.tEmodex\_1,ewfd.tEmodex\_1)+realdot(ewfd.tEmodey\_1,ewfd.tEmodey\_1)+realdot(ewfd.tEmodez\_1,ewfd.tEmodez\_1)) | V/m | Port tangential electric mode field norm | Boundary 52 |  |
| ewfd.tHmodex\_1 | ewfd.tH0modex\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | A/m | Port tangential magnetic mode field, x component | Boundary 52 |  |
| ewfd.tHmodey\_1 | ewfd.tH0modey\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | A/m | Port tangential magnetic mode field, y component | Boundary 52 |  |
| ewfd.tHmodez\_1 | ewfd.tH0modez\_1\*sqrt(abs(ewfd.port1.Pin/ewfd.Pmode\_1)) | A/m | Port tangential magnetic mode field, z component | Boundary 52 |  |
| ewfd.normtHmode\_1 | sqrt(realdot(ewfd.tHmodex\_1,ewfd.tHmodex\_1)+realdot(ewfd.tHmodey\_1,ewfd.tHmodey\_1)+realdot(ewfd.tHmodez\_1,ewfd.tHmodez\_1)) | A/m | Port tangential magnetic mode field norm | Boundary 52 |  |
| ewfd.kDiffractionParallelx\_1 | 0 | rad/m | Diffraction order wave vector, parallel to port, x component | Boundary 52 |  |
| ewfd.kDiffractionParallely\_1 | 0 | rad/m | Diffraction order wave vector, parallel to port, y component | Boundary 52 |  |
| ewfd.kDiffractionParallelz\_1 | 0 | rad/m | Diffraction order wave vector, parallel to port, z component | Boundary 52 |  |
| ewfd.alphaport\_1 | if(arg(ewfd.kF^2-ewfd.kDiffractionParallelx\_1^2-ewfd.kDiffractionParallely\_1^2-ewfd.kDiffractionParallelz\_1^2)<pi,sqrt(abs(ewfd.kF^2-ewfd.kDiffractionParallelx\_1^2-ewfd.kDiffractionParallely\_1^2-ewfd.kDiffractionParallelz\_1^2))\*exp(0.5\*j\*arg(ewfd.kF^2-ewfd.kDiffractionParallelx\_1^2-ewfd.kDiffractionParallely\_1^2-ewfd.kDiffractionParallelz\_1^2)),-j\*sqrt(abs(ewfd.kF^2-ewfd.kDiffractionParallelx\_1^2-ewfd.kDiffractionParallely\_1^2-ewfd.kDiffractionParallelz\_1^2)))\*j | rad/m | Complex propagation constant | Global |  |
| ewfd.E0x\_1 | exp(-j\*(ewfd.kDiffractionParallelx\_1\*x+ewfd.kDiffractionParallely\_1\*y+ewfd.kDiffractionParallelz\_1\*z)) | V/m | Electric field, x component | Boundary 52 |  |
| ewfd.E0y\_1 | c\*j\*exp(-j\*(ewfd.kDiffractionParallelx\_1\*x+ewfd.kDiffractionParallely\_1\*y+ewfd.kDiffractionParallelz\_1\*z)) | V/m | Electric field, y component | Boundary 52 |  |
| ewfd.E0z\_1 | 0 | V/m | Electric field, z component | Boundary 52 |  |
| ewfd.tE0modex\_1 | (ewfd.ny\*ewfd.E0x\_1-ewfd.nx\*ewfd.E0y\_1)\*ewfd.ny+(ewfd.nz\*ewfd.E0x\_1-ewfd.nx\*ewfd.E0z\_1)\*ewfd.nz | V/m | Port tangential electric mode field, x component | Boundary 52 |  |
| ewfd.tE0modey\_1 | (-ewfd.ny\*ewfd.E0x\_1+ewfd.nx\*ewfd.E0y\_1)\*ewfd.nx+(ewfd.nz\*ewfd.E0y\_1-ewfd.ny\*ewfd.E0z\_1)\*ewfd.nz | V/m | Port tangential electric mode field, y component | Boundary 52 |  |
| ewfd.tE0modez\_1 | (-ewfd.nz\*ewfd.E0x\_1+ewfd.nx\*ewfd.E0z\_1)\*ewfd.nx+(-ewfd.nz\*ewfd.E0y\_1+ewfd.ny\*ewfd.E0z\_1)\*ewfd.ny | V/m | Port tangential electric mode field, z component | Boundary 52 |  |
| ewfd.curlEx\_1 | ewfd.alphaport\_1\*(ewfd.tE0modez\_1\*ewfd.ny-ewfd.tE0modey\_1\*ewfd.nz)-dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),z)\*ewfd.ny+dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),y)\*ewfd.nz | V/m² | Curl of electric field, x component | Boundary 52 |  |
| ewfd.curlEy\_1 | ewfd.alphaport\_1\*(-ewfd.tE0modez\_1\*ewfd.nx+ewfd.tE0modex\_1\*ewfd.nz)+dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),z)\*ewfd.nx-dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),x)\*ewfd.nz | V/m² | Curl of electric field, y component | Boundary 52 |  |
| ewfd.curlEz\_1 | ewfd.alphaport\_1\*(ewfd.tE0modey\_1\*ewfd.nx-ewfd.tE0modex\_1\*ewfd.ny)-dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),y)\*ewfd.nx+dtang(ewfd.E0x\_1\*nojac(ewfd.nx)+ewfd.E0y\_1\*nojac(ewfd.ny)+ewfd.E0z\_1\*nojac(ewfd.nz),x)\*ewfd.ny | V/m² | Curl of electric field, z component | Boundary 52 |  |
| ewfd.Hmodex\_1 | (-ewfd.murinvxx\*ewfd.curlEx\_1-ewfd.murinvxy\*ewfd.curlEy\_1-ewfd.murinvxz\*ewfd.curlEz\_1)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, x component | Boundary 52 |  |
| ewfd.Hmodey\_1 | (-ewfd.murinvyx\*ewfd.curlEx\_1-ewfd.murinvyy\*ewfd.curlEy\_1-ewfd.murinvyz\*ewfd.curlEz\_1)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, y component | Boundary 52 |  |
| ewfd.Hmodez\_1 | (-ewfd.murinvzx\*ewfd.curlEx\_1-ewfd.murinvzy\*ewfd.curlEy\_1-ewfd.murinvzz\*ewfd.curlEz\_1)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, z component | Boundary 52 |  |
| ewfd.tH0modex\_1 | ewfd.Hmodex\_1-(ewfd.nx\*ewfd.Hmodex\_1+ewfd.ny\*ewfd.Hmodey\_1+ewfd.nz\*ewfd.Hmodez\_1)\*ewfd.nx | A/m | Port tangential magnetic mode field, x component | Boundary 52 |  |
| ewfd.tH0modey\_1 | ewfd.Hmodey\_1-(ewfd.nx\*ewfd.Hmodex\_1+ewfd.ny\*ewfd.Hmodey\_1+ewfd.nz\*ewfd.Hmodez\_1)\*ewfd.ny | A/m | Port tangential magnetic mode field, y component | Boundary 52 |  |
| ewfd.tH0modez\_1 | ewfd.Hmodez\_1-(ewfd.nx\*ewfd.Hmodex\_1+ewfd.ny\*ewfd.Hmodey\_1+ewfd.nz\*ewfd.Hmodez\_1)\*ewfd.nz | A/m | Port tangential magnetic mode field, z component | Boundary 52 |  |
| ewfd.Eamplx\_1 | 1 | V/m | Electric field amplitude, x component | Boundary 52 |  |
| ewfd.Eamply\_1 | c\*j | V/m | Electric field amplitude, y component | Boundary 52 |  |
| ewfd.Eamplz\_1 | 0 | V/m | Electric field amplitude, z component | Boundary 52 |  |
| ewfd.kIncx\_1 | ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.alphaport\_1\*j | rad/m | Incident wave vector, x component | Boundary 52 |  |
| ewfd.kIncy\_1 | ewfd.kDiffractionParallely\_1+ewfd.ny\*ewfd.alphaport\_1\*j | rad/m | Incident wave vector, y component | Boundary 52 |  |
| ewfd.kIncz\_1 | ewfd.kDiffractionParallelz\_1+ewfd.nz\*ewfd.alphaport\_1\*j | rad/m | Incident wave vector, z component | Boundary 52 |  |
| ewfd.kModex\_1 | ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.alphaport\_1\*j | rad/m | Port mode wave vector, x component | Boundary 52 |  |
| ewfd.kModey\_1 | ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.alphaport\_1\*j | rad/m | Port mode wave vector, y component | Boundary 52 |  |
| ewfd.kModez\_1 | ewfd.kDiffractionParallelz\_1-ewfd.nz\*ewfd.alphaport\_1\*j | rad/m | Port mode wave vector, z component | Boundary 52 |  |
| ewfd.eJROOPx\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))<1000\*eps\*ewfd.kF,if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12),0)\*ewfd.nz,(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))) | 1 | Jones base vector on reflection side, out-of-plane direction, order [0,0], x component | Boundary 52 |  |
| ewfd.eJROOPy\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))<1000\*eps\*ewfd.kF,-if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12))\*ewfd.nz,(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))) | 1 | Jones base vector on reflection side, out-of-plane direction, order [0,0], y component | Boundary 52 |  |
| ewfd.eJROOPz\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))<1000\*eps\*ewfd.kF,-if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12),0)\*ewfd.nx+if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12))\*ewfd.ny,(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1,ewfd.nz\*ewfd.kDiffractionParallely\_1-ewfd.ny\*ewfd.kDiffractionParallelz\_1)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1,-ewfd.nz\*ewfd.kDiffractionParallelx\_1+ewfd.nx\*ewfd.kDiffractionParallelz\_1)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1,ewfd.ny\*ewfd.kDiffractionParallelx\_1-ewfd.nx\*ewfd.kDiffractionParallely\_1))) | 1 | Jones base vector on reflection side, out-of-plane direction, order [0,0], z component | Boundary 52 |  |
| ewfd.eJRIPx\_0\_0 | (ewfd.eJROOPz\_0\_0\*ewfd.kModey\_1-ewfd.eJROOPy\_0\_0\*ewfd.kModez\_1)/ewfd.k | 1 | Jones base vector on reflection side, in-plane direction, order [0,0], x component | Boundary 52 |  |
| ewfd.eJRIPy\_0\_0 | (-ewfd.eJROOPz\_0\_0\*ewfd.kModex\_1+ewfd.eJROOPx\_0\_0\*ewfd.kModez\_1)/ewfd.k | 1 | Jones base vector on reflection side, in-plane direction, order [0,0], y component | Boundary 52 |  |
| ewfd.eJRIPz\_0\_0 | (ewfd.eJROOPy\_0\_0\*ewfd.kModex\_1-ewfd.eJROOPx\_0\_0\*ewfd.kModey\_1)/ewfd.k | 1 | Jones base vector on reflection side, in-plane direction, order [0,0], z component | Boundary 52 |  |
| ewfd.JROOP\_0\_0 | ewfd.intport1(ewfd.S11\*((ewfd.tEmodex\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.nx/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJROOPx\_0\_0+(ewfd.tEmodey\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.ny/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJROOPy\_0\_0+(ewfd.tEmodez\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.nz/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJROOPz\_0\_0)\*exp((ewfd.kDiffractionParallelx\_1\*x+ewfd.kDiffractionParallely\_1\*y+ewfd.kDiffractionParallelz\_1\*z)\*j))/ewfd.Area\_1 | V/m | Jones vector amplitude on reflection side, out-of-plane component, order [0,0] | Global | + operation |
| ewfd.JRIP\_0\_0 | ewfd.intport1(ewfd.S11\*((ewfd.tEmodex\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.nx/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJRIPx\_0\_0+(ewfd.tEmodey\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.ny/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJRIPy\_0\_0+(ewfd.tEmodez\_1+3\*(ewfd.nx\*(ewfd.tHmodez\_1\*ewfd.kDiffractionParallely\_1-ewfd.tHmodey\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.ny\*(-ewfd.tHmodez\_1\*ewfd.kDiffractionParallelx\_1+ewfd.tHmodex\_1\*ewfd.kDiffractionParallelz\_1)+ewfd.nz\*(ewfd.tHmodey\_1\*ewfd.kDiffractionParallelx\_1-ewfd.tHmodex\_1\*ewfd.kDiffractionParallely\_1))\*ewfd.nz/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJRIPz\_0\_0)\*exp((ewfd.kDiffractionParallelx\_1\*x+ewfd.kDiffractionParallely\_1\*y+ewfd.kDiffractionParallelz\_1\*z)\*j))/ewfd.Area\_1 | V/m | Jones vector amplitude on reflection side, in-plane component, order [0,0] | Global | + operation |
| ewfd.normJR\_0\_0 | sqrt(realdot(ewfd.JROOP\_0\_0,ewfd.JROOP\_0\_0)+realdot(ewfd.JRIP\_0\_0,ewfd.JRIP\_0\_0)) | V/m | Jones vector norm on reflection side, order [0,0] | Global |  |

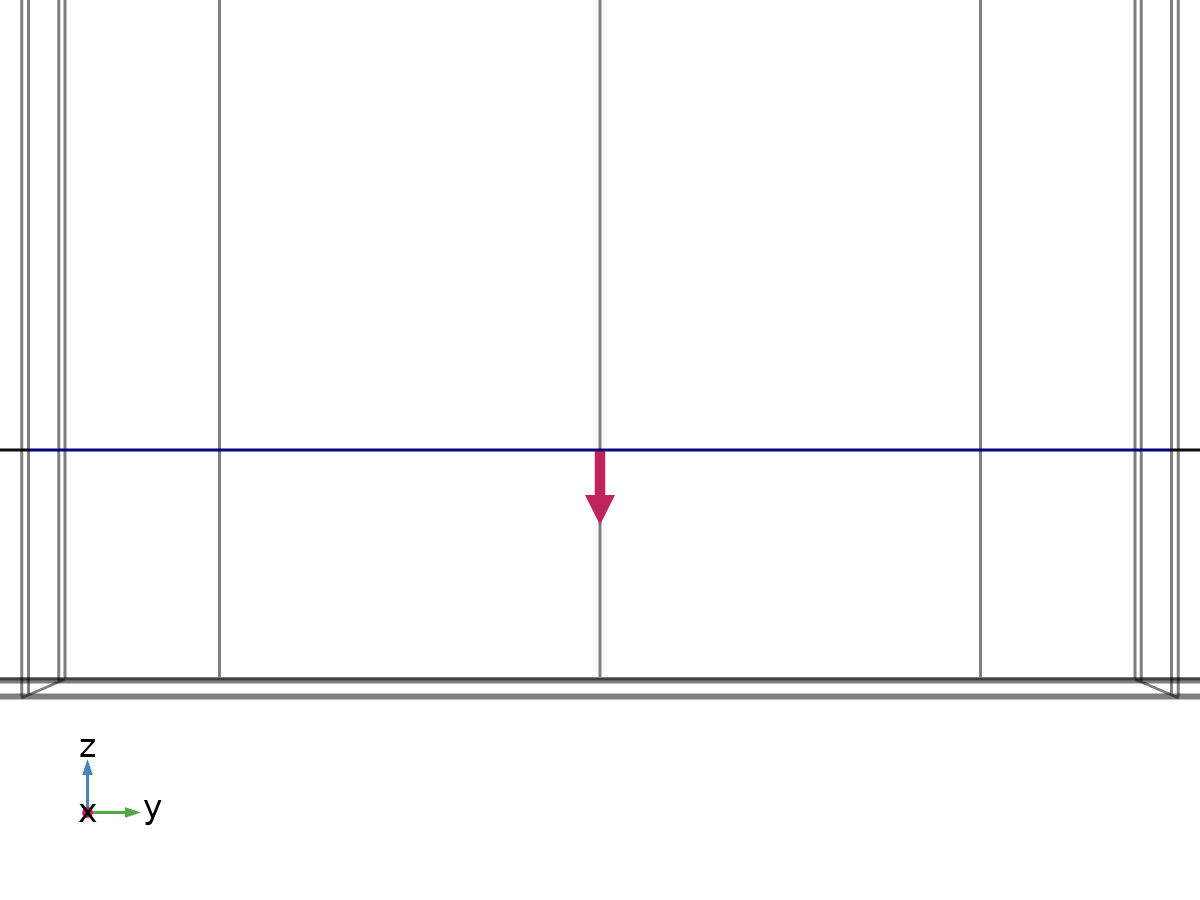
#### Weak Expressions

| **Weak expression** | **Integration order** | **Integration frame** | **Selection** |
| --- | --- | --- | --- |
| test(if(sqrt(ewfd.intport1(abs(ewfd.kF-ewfd.intport1(ewfd.kF)/ewfd.Area\_1)^2)/ewfd.Area\_1)<1.0E-12\*abs(ewfd.intport1(ewfd.kF)/ewfd.Area\_1),0,error('The material properties adjacent to a periodic port must be homogeneous.'))) | 4 | Material | Boundary 52 |
| test(if(sqrt(ewfd.intport1(sqrt((ewfd.nx-ewfd.intport1(ewfd.nx)/ewfd.Area\_1)^2+(ewfd.ny-ewfd.intport1(ewfd.ny)/ewfd.Area\_1)^2+(ewfd.nz-ewfd.intport1(ewfd.nz)/ewfd.Area\_1)^2)^2)/ewfd.Area\_1)<1.0E-12\*sqrt((ewfd.intport1(ewfd.nx)^2+ewfd.intport1(ewfd.ny)^2+ewfd.intport1(ewfd.nz)^2)/ewfd.Area\_1^2),0,error('Periodic ports must have planar boundaries.'))) | 4 | Material | Boundary 52 |
| ewfd.iomega\*mu0\_const\*(-(ewfd.tHmodez\_1\*ewfd.ny-ewfd.tHmodey\_1\*ewfd.nz)\*conj(ewfd.tEmodex\_1)-(-ewfd.tHmodez\_1\*ewfd.nx+ewfd.tHmodex\_1\*ewfd.nz)\*conj(ewfd.tEmodey\_1)-(ewfd.tHmodey\_1\*ewfd.nx-ewfd.tHmodex\_1\*ewfd.ny)\*conj(ewfd.tEmodez\_1))\*test(1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0))\*(-1+if(abs(ewfd.beta\_1)>1.0E-7\*ewfd.intport1(ewfd.k)/ewfd.Area\_1&&(abs(arg(ewfd.beta\_1))<=0.25\*pi||abs(arg(ewfd.beta\_1))>=0.75\*pi),ewfd.S1x,0)) | 4 | Material | Boundary 52 |

#### Constraints

| **Constraint** | **Constraint force** | **Shape function** | **Selection** | **Details** |
| --- | --- | --- | --- | --- |
| ewfd.tEx-ewfd.PortConstrx | test(ewfd.tEx)-ewfd.PortConstrx\_weak | Curl (Quadratic) | Boundary 52 | Nodal |
| ewfd.tEy-ewfd.PortConstry | test(ewfd.tEy)-ewfd.PortConstry\_weak | Curl (Quadratic) | Boundary 52 | Nodal |
| ewfd.tEz-ewfd.PortConstrz | test(ewfd.tEz)-ewfd.PortConstrz\_weak | Curl (Quadratic) | Boundary 52 | Nodal |

* + 1. Port 2

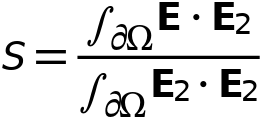


Port 2

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundary 49 |

Equations



#### Port Properties

Settings

| **Description** | **Value** |
| --- | --- |
| Port name | 2 |
| Type of port | Periodic |
| Wave excitation at this port | Off |
| Activate slit condition on interior port | Off |

#### Port Mode Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Input quantity | Electric field |
| Electric mode field amplitude | {1, c\*j, 0} |
| Mode phase | 0 |

#### Automatic Diffraction Order Calculation

Settings

| **Description** | **Value** |
| --- | --- |
| Include in automatic diffraction order calculation | On |
| Refractive index, real part | {{1.33, 0, 0}, {0, 1.33, 0}, {0, 0, 1.33}} |

#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd.PortConstrx | nojac(ewfd.tEmodex\_2)\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0) | V/m | Port constraint, x component | Boundary 49 | + operation |
| ewfd.PortConstry | nojac(ewfd.tEmodey\_2)\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0) | V/m | Port constraint, y component | Boundary 49 | + operation |
| ewfd.PortConstrz | nojac(ewfd.tEmodez\_2)\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0) | V/m | Port constraint, z component | Boundary 49 | + operation |
| ewfd.PortConstrx\_weak | test(nojac(conj(ewfd.tEmodex\_2))\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0)) | V/m | Port constraint, x component | Boundary 49 | + operation |
| ewfd.PortConstry\_weak | test(nojac(conj(ewfd.tEmodey\_2))\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0)) | V/m | Port constraint, y component | Boundary 49 | + operation |
| ewfd.PortConstrz\_weak | test(nojac(conj(ewfd.tEmodez\_2))\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0)) | V/m | Port constraint, z component | Boundary 49 | + operation |
| ewfd.kF | ewfd.k | rad/m | Wave number for Floquet periodicity | Boundary 49 |  |
| ewfd.Area\_2 | ewfd.intport2(1) | m² | Area | Global |  |
| ewfd.beta\_2 | ewfd.intport2(-ewfd.alphaport\_2\*j)/ewfd.Area\_2 | rad/m | Propagation constant | Global |  |
| ewfd.Pmode\_2 | ewfd.intport2(if(imag(ewfd.alphaport\_2)==0,1,0.5\*(ewfd.nx\*real(conj(ewfd.tH0modez\_2)\*ewfd.tE0modey\_2-conj(ewfd.tH0modey\_2)\*ewfd.tE0modez\_2)+ewfd.ny\*real(-conj(ewfd.tH0modez\_2)\*ewfd.tE0modex\_2+conj(ewfd.tH0modex\_2)\*ewfd.tE0modez\_2)+ewfd.nz\*real(conj(ewfd.tH0modey\_2)\*ewfd.tE0modex\_2-conj(ewfd.tH0modex\_2)\*ewfd.tE0modey\_2)))) | W | Port mode power | Global |  |
| ewfd.tEmodex\_2 | ewfd.tE0modex\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | V/m | Port tangential electric mode field, x component | Boundary 49 |  |
| ewfd.tEmodey\_2 | ewfd.tE0modey\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | V/m | Port tangential electric mode field, y component | Boundary 49 |  |
| ewfd.tEmodez\_2 | ewfd.tE0modez\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | V/m | Port tangential electric mode field, z component | Boundary 49 |  |
| ewfd.normtEmode\_2 | sqrt(realdot(ewfd.tEmodex\_2,ewfd.tEmodex\_2)+realdot(ewfd.tEmodey\_2,ewfd.tEmodey\_2)+realdot(ewfd.tEmodez\_2,ewfd.tEmodez\_2)) | V/m | Port tangential electric mode field norm | Boundary 49 |  |
| ewfd.tHmodex\_2 | ewfd.tH0modex\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | A/m | Port tangential magnetic mode field, x component | Boundary 49 |  |
| ewfd.tHmodey\_2 | ewfd.tH0modey\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | A/m | Port tangential magnetic mode field, y component | Boundary 49 |  |
| ewfd.tHmodez\_2 | ewfd.tH0modez\_2\*sqrt(abs(try\_catch(ewfd.port2.Pin,1)/ewfd.Pmode\_2)) | A/m | Port tangential magnetic mode field, z component | Boundary 49 |  |
| ewfd.normtHmode\_2 | sqrt(realdot(ewfd.tHmodex\_2,ewfd.tHmodex\_2)+realdot(ewfd.tHmodey\_2,ewfd.tHmodey\_2)+realdot(ewfd.tHmodez\_2,ewfd.tHmodez\_2)) | A/m | Port tangential magnetic mode field norm | Boundary 49 |  |
| ewfd.kDiffractionParallelx\_2 | ewfd.kPeriodicx | rad/m | Diffraction order wave vector, parallel to port, x component | Boundary 49 |  |
| ewfd.kDiffractionParallely\_2 | ewfd.kPeriodicy | rad/m | Diffraction order wave vector, parallel to port, y component | Boundary 49 |  |
| ewfd.kDiffractionParallelz\_2 | ewfd.kPeriodicz | rad/m | Diffraction order wave vector, parallel to port, z component | Boundary 49 |  |
| ewfd.alphaport\_2 | if(arg(ewfd.kF^2-ewfd.kDiffractionParallelx\_2^2-ewfd.kDiffractionParallely\_2^2-ewfd.kDiffractionParallelz\_2^2)<pi,sqrt(abs(ewfd.kF^2-ewfd.kDiffractionParallelx\_2^2-ewfd.kDiffractionParallely\_2^2-ewfd.kDiffractionParallelz\_2^2))\*exp(0.5\*j\*arg(ewfd.kF^2-ewfd.kDiffractionParallelx\_2^2-ewfd.kDiffractionParallely\_2^2-ewfd.kDiffractionParallelz\_2^2)),-j\*sqrt(abs(ewfd.kF^2-ewfd.kDiffractionParallelx\_2^2-ewfd.kDiffractionParallely\_2^2-ewfd.kDiffractionParallelz\_2^2)))\*j | rad/m | Complex propagation constant | Global |  |
| ewfd.E0x\_2 | exp(-j\*(ewfd.kDiffractionParallelx\_2\*x+ewfd.kDiffractionParallely\_2\*y+ewfd.kDiffractionParallelz\_2\*z)) | V/m | Electric field, x component | Boundary 49 |  |
| ewfd.E0y\_2 | c\*j\*exp(-j\*(ewfd.kDiffractionParallelx\_2\*x+ewfd.kDiffractionParallely\_2\*y+ewfd.kDiffractionParallelz\_2\*z)) | V/m | Electric field, y component | Boundary 49 |  |
| ewfd.E0z\_2 | 0 | V/m | Electric field, z component | Boundary 49 |  |
| ewfd.tE0modex\_2 | (ewfd.ny\*ewfd.E0x\_2-ewfd.nx\*ewfd.E0y\_2)\*ewfd.ny+(ewfd.nz\*ewfd.E0x\_2-ewfd.nx\*ewfd.E0z\_2)\*ewfd.nz | V/m | Port tangential electric mode field, x component | Boundary 49 |  |
| ewfd.tE0modey\_2 | (-ewfd.ny\*ewfd.E0x\_2+ewfd.nx\*ewfd.E0y\_2)\*ewfd.nx+(ewfd.nz\*ewfd.E0y\_2-ewfd.ny\*ewfd.E0z\_2)\*ewfd.nz | V/m | Port tangential electric mode field, y component | Boundary 49 |  |
| ewfd.tE0modez\_2 | (-ewfd.nz\*ewfd.E0x\_2+ewfd.nx\*ewfd.E0z\_2)\*ewfd.nx+(-ewfd.nz\*ewfd.E0y\_2+ewfd.ny\*ewfd.E0z\_2)\*ewfd.ny | V/m | Port tangential electric mode field, z component | Boundary 49 |  |
| ewfd.curlEx\_2 | ewfd.alphaport\_2\*(ewfd.tE0modez\_2\*ewfd.ny-ewfd.tE0modey\_2\*ewfd.nz)-dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),z)\*ewfd.ny+dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),y)\*ewfd.nz | V/m² | Curl of electric field, x component | Boundary 49 |  |
| ewfd.curlEy\_2 | ewfd.alphaport\_2\*(-ewfd.tE0modez\_2\*ewfd.nx+ewfd.tE0modex\_2\*ewfd.nz)+dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),z)\*ewfd.nx-dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),x)\*ewfd.nz | V/m² | Curl of electric field, y component | Boundary 49 |  |
| ewfd.curlEz\_2 | ewfd.alphaport\_2\*(ewfd.tE0modey\_2\*ewfd.nx-ewfd.tE0modex\_2\*ewfd.ny)-dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),y)\*ewfd.nx+dtang(ewfd.E0x\_2\*nojac(ewfd.nx)+ewfd.E0y\_2\*nojac(ewfd.ny)+ewfd.E0z\_2\*nojac(ewfd.nz),x)\*ewfd.ny | V/m² | Curl of electric field, z component | Boundary 49 |  |
| ewfd.Hmodex\_2 | (-ewfd.murinvxx\*ewfd.curlEx\_2-ewfd.murinvxy\*ewfd.curlEy\_2-ewfd.murinvxz\*ewfd.curlEz\_2)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, x component | Boundary 49 |  |
| ewfd.Hmodey\_2 | (-ewfd.murinvyx\*ewfd.curlEx\_2-ewfd.murinvyy\*ewfd.curlEy\_2-ewfd.murinvyz\*ewfd.curlEz\_2)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, y component | Boundary 49 |  |
| ewfd.Hmodez\_2 | (-ewfd.murinvzx\*ewfd.curlEx\_2-ewfd.murinvzy\*ewfd.curlEy\_2-ewfd.murinvzz\*ewfd.curlEz\_2)/(ewfd.iomega\*mu0\_const) | A/m | Magnetic mode field, z component | Boundary 49 |  |
| ewfd.tH0modex\_2 | ewfd.Hmodex\_2-(ewfd.nx\*ewfd.Hmodex\_2+ewfd.ny\*ewfd.Hmodey\_2+ewfd.nz\*ewfd.Hmodez\_2)\*ewfd.nx | A/m | Port tangential magnetic mode field, x component | Boundary 49 |  |
| ewfd.tH0modey\_2 | ewfd.Hmodey\_2-(ewfd.nx\*ewfd.Hmodex\_2+ewfd.ny\*ewfd.Hmodey\_2+ewfd.nz\*ewfd.Hmodez\_2)\*ewfd.ny | A/m | Port tangential magnetic mode field, y component | Boundary 49 |  |
| ewfd.tH0modez\_2 | ewfd.Hmodez\_2-(ewfd.nx\*ewfd.Hmodex\_2+ewfd.ny\*ewfd.Hmodey\_2+ewfd.nz\*ewfd.Hmodez\_2)\*ewfd.nz | A/m | Port tangential magnetic mode field, z component | Boundary 49 |  |
| ewfd.Eamplx\_2 | 1 | V/m | Electric field amplitude, x component | Boundary 49 |  |
| ewfd.Eamply\_2 | c\*j | V/m | Electric field amplitude, y component | Boundary 49 |  |
| ewfd.Eamplz\_2 | 0 | V/m | Electric field amplitude, z component | Boundary 49 |  |
| ewfd.kModex\_2 | ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.alphaport\_2\*j | rad/m | Port mode wave vector, x component | Boundary 49 |  |
| ewfd.kModey\_2 | ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.alphaport\_2\*j | rad/m | Port mode wave vector, y component | Boundary 49 |  |
| ewfd.kModez\_2 | ewfd.kDiffractionParallelz\_2-ewfd.nz\*ewfd.alphaport\_2\*j | rad/m | Port mode wave vector, z component | Boundary 49 |  |
| ewfd.eJTOOPx\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))<1000\*eps\*ewfd.kF,if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12)),(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))) | 1 | Jones base vector on transmission side, out-of-plane direction, order [0,0], x component | Boundary 49 |  |
| ewfd.eJTOOPy\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))<1000\*eps\*ewfd.kF,if(sign(-1.9600000000000005E-12\*ewfd.nz/sqrt(1.9600000000000005E-12)^2)>=0,1.4000000000000001E-6/sqrt(1.9600000000000005E-12),0),(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))) | 1 | Jones base vector on transmission side, out-of-plane direction, order [0,0], y component | Boundary 49 |  |
| ewfd.eJTOOPz\_0\_0 | if(sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))<1000\*eps\*ewfd.kF,0,(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2)/sqrt(realdot(ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2,ewfd.nz\*ewfd.kDiffractionParallely\_2-ewfd.ny\*ewfd.kDiffractionParallelz\_2)+realdot(-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2,-ewfd.nz\*ewfd.kDiffractionParallelx\_2+ewfd.nx\*ewfd.kDiffractionParallelz\_2)+realdot(ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2,ewfd.ny\*ewfd.kDiffractionParallelx\_2-ewfd.nx\*ewfd.kDiffractionParallely\_2))) | 1 | Jones base vector on transmission side, out-of-plane direction, order [0,0], z component | Boundary 49 |  |
| ewfd.eJTIPx\_0\_0 | (ewfd.eJTOOPz\_0\_0\*ewfd.kModey\_2-ewfd.eJTOOPy\_0\_0\*ewfd.kModez\_2)/ewfd.k | 1 | Jones base vector on transmission side, in-plane direction, order [0,0], x component | Boundary 49 |  |
| ewfd.eJTIPy\_0\_0 | (-ewfd.eJTOOPz\_0\_0\*ewfd.kModex\_2+ewfd.eJTOOPx\_0\_0\*ewfd.kModez\_2)/ewfd.k | 1 | Jones base vector on transmission side, in-plane direction, order [0,0], y component | Boundary 49 |  |
| ewfd.eJTIPz\_0\_0 | (ewfd.eJTOOPy\_0\_0\*ewfd.kModex\_2-ewfd.eJTOOPx\_0\_0\*ewfd.kModey\_2)/ewfd.k | 1 | Jones base vector on transmission side, in-plane direction, order [0,0], z component | Boundary 49 |  |
| ewfd.JTOOP\_0\_0 | ewfd.intport2(ewfd.S21\*((ewfd.tEmodex\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.nx/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTOOPx\_0\_0+(ewfd.tEmodey\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.ny/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTOOPy\_0\_0+(ewfd.tEmodez\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.nz/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTOOPz\_0\_0)\*exp((ewfd.kDiffractionParallelx\_2\*x+ewfd.kDiffractionParallely\_2\*y+ewfd.kDiffractionParallelz\_2\*z)\*j))/ewfd.Area\_2 | V/m | Jones vector amplitude on transmission side, out-of-plane component, order [0,0] | Global | + operation |
| ewfd.JTIP\_0\_0 | ewfd.intport2(ewfd.S21\*((ewfd.tEmodex\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.nx/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTIPx\_0\_0+(ewfd.tEmodey\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.ny/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTIPy\_0\_0+(ewfd.tEmodez\_2+3\*(ewfd.nx\*(ewfd.tHmodez\_2\*ewfd.kDiffractionParallely\_2-ewfd.tHmodey\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.ny\*(-ewfd.tHmodez\_2\*ewfd.kDiffractionParallelx\_2+ewfd.tHmodex\_2\*ewfd.kDiffractionParallelz\_2)+ewfd.nz\*(ewfd.tHmodey\_2\*ewfd.kDiffractionParallelx\_2-ewfd.tHmodex\_2\*ewfd.kDiffractionParallely\_2))\*ewfd.nz/(ewfd.omega\*epsilon0\_const\*(ewfd.epsilonrxx-ewfd.sigmaxx\*j/ewfd.omega+ewfd.epsilonryy-ewfd.sigmayy\*j/ewfd.omega+ewfd.epsilonrzz-ewfd.sigmazz\*j/ewfd.omega)))\*ewfd.eJTIPz\_0\_0)\*exp((ewfd.kDiffractionParallelx\_2\*x+ewfd.kDiffractionParallely\_2\*y+ewfd.kDiffractionParallelz\_2\*z)\*j))/ewfd.Area\_2 | V/m | Jones vector amplitude on transmission side, in-plane component, order [0,0] | Global | + operation |
| ewfd.normJT\_0\_0 | sqrt(realdot(ewfd.JTOOP\_0\_0,ewfd.JTOOP\_0\_0)+realdot(ewfd.JTIP\_0\_0,ewfd.JTIP\_0\_0)) | V/m | Jones vector norm on transmission side, order [0,0] | Global |  |

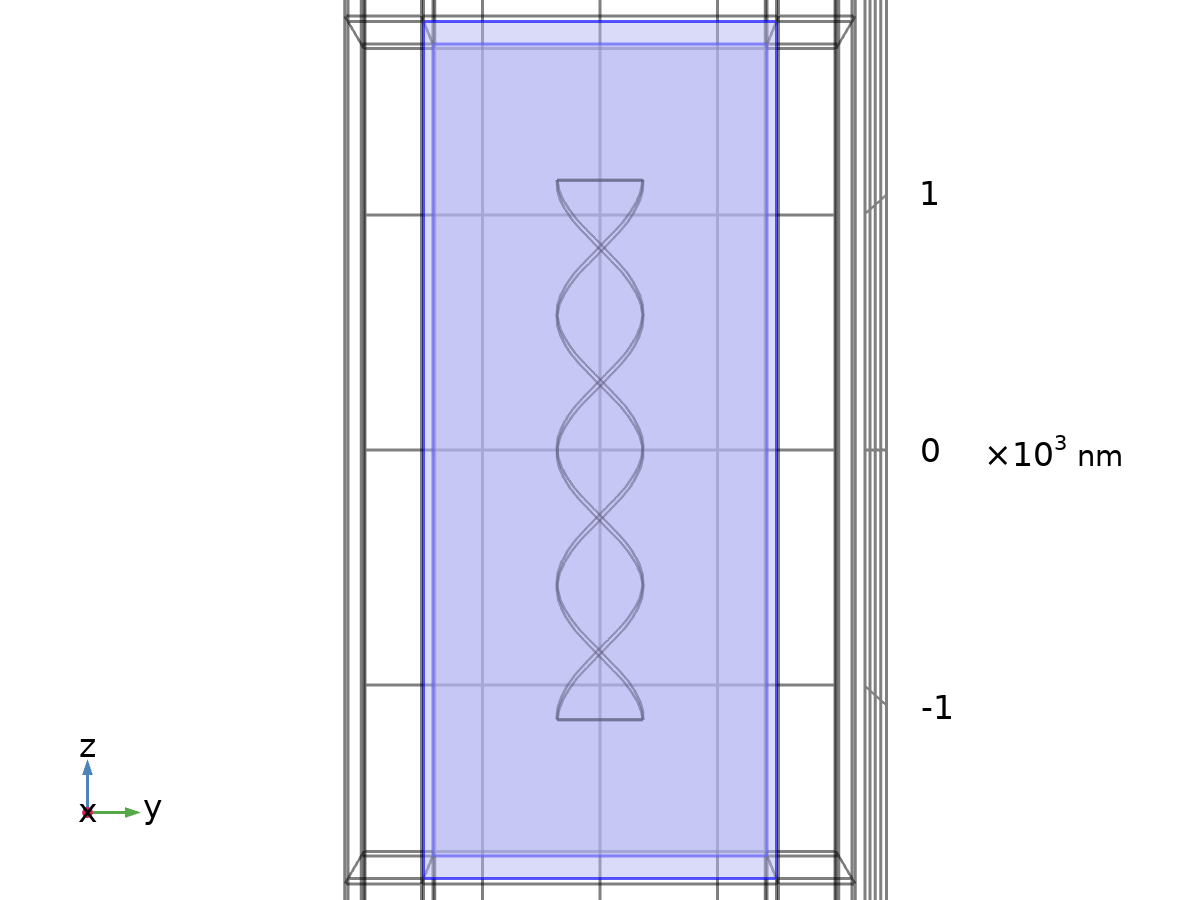
#### Weak Expressions

| **Weak expression** | **Integration order** | **Integration frame** | **Selection** |
| --- | --- | --- | --- |
| test(if(sqrt(ewfd.intport2(abs(ewfd.kF-ewfd.intport2(ewfd.kF)/ewfd.Area\_2)^2)/ewfd.Area\_2)<1.0E-12\*abs(ewfd.intport2(ewfd.kF)/ewfd.Area\_2),0,error('The material properties adjacent to a periodic port must be homogeneous.'))) | 4 | Material | Boundary 49 |
| test(if(sqrt(ewfd.intport2(sqrt((ewfd.nx-ewfd.intport2(ewfd.nx)/ewfd.Area\_2)^2+(ewfd.ny-ewfd.intport2(ewfd.ny)/ewfd.Area\_2)^2+(ewfd.nz-ewfd.intport2(ewfd.nz)/ewfd.Area\_2)^2)^2)/ewfd.Area\_2)<1.0E-12\*sqrt((ewfd.intport2(ewfd.nx)^2+ewfd.intport2(ewfd.ny)^2+ewfd.intport2(ewfd.nz)^2)/ewfd.Area\_2^2),0,error('Periodic ports must have planar boundaries.'))) | 4 | Material | Boundary 49 |
| ewfd.iomega\*mu0\_const\*(-(ewfd.tHmodez\_2\*ewfd.ny-ewfd.tHmodey\_2\*ewfd.nz)\*conj(ewfd.tEmodex\_2)-(-ewfd.tHmodez\_2\*ewfd.nx+ewfd.tHmodex\_2\*ewfd.nz)\*conj(ewfd.tEmodey\_2)-(ewfd.tHmodey\_2\*ewfd.nx-ewfd.tHmodex\_2\*ewfd.ny)\*conj(ewfd.tEmodez\_2))\*test(if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0))\*if(abs(ewfd.beta\_2)>1.0E-7\*ewfd.intport2(ewfd.k)/ewfd.Area\_2&&(abs(arg(ewfd.beta\_2))<=0.25\*pi||abs(arg(ewfd.beta\_2))>=0.75\*pi),ewfd.S2x,0) | 4 | Material | Boundary 49 |

#### Constraints

| **Constraint** | **Constraint force** | **Shape function** | **Selection** | **Details** |
| --- | --- | --- | --- | --- |
| ewfd.tEx-ewfd.PortConstrx | test(ewfd.tEx)-ewfd.PortConstrx\_weak | Curl (Quadratic) | Boundary 49 | Nodal |
| ewfd.tEy-ewfd.PortConstry | test(ewfd.tEy)-ewfd.PortConstry\_weak | Curl (Quadratic) | Boundary 49 | Nodal |
| ewfd.tEz-ewfd.PortConstrz | test(ewfd.tEz)-ewfd.PortConstrz\_weak | Curl (Quadratic) | Boundary 49 | Nodal |

* + 1. Periodic Condition 1



Periodic Condition 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundaries 47, 86 |

Equations





#### Periodicity Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Type of periodicity | Floquet periodicity |
| k-vector for Floquet periodicity | From periodic port |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

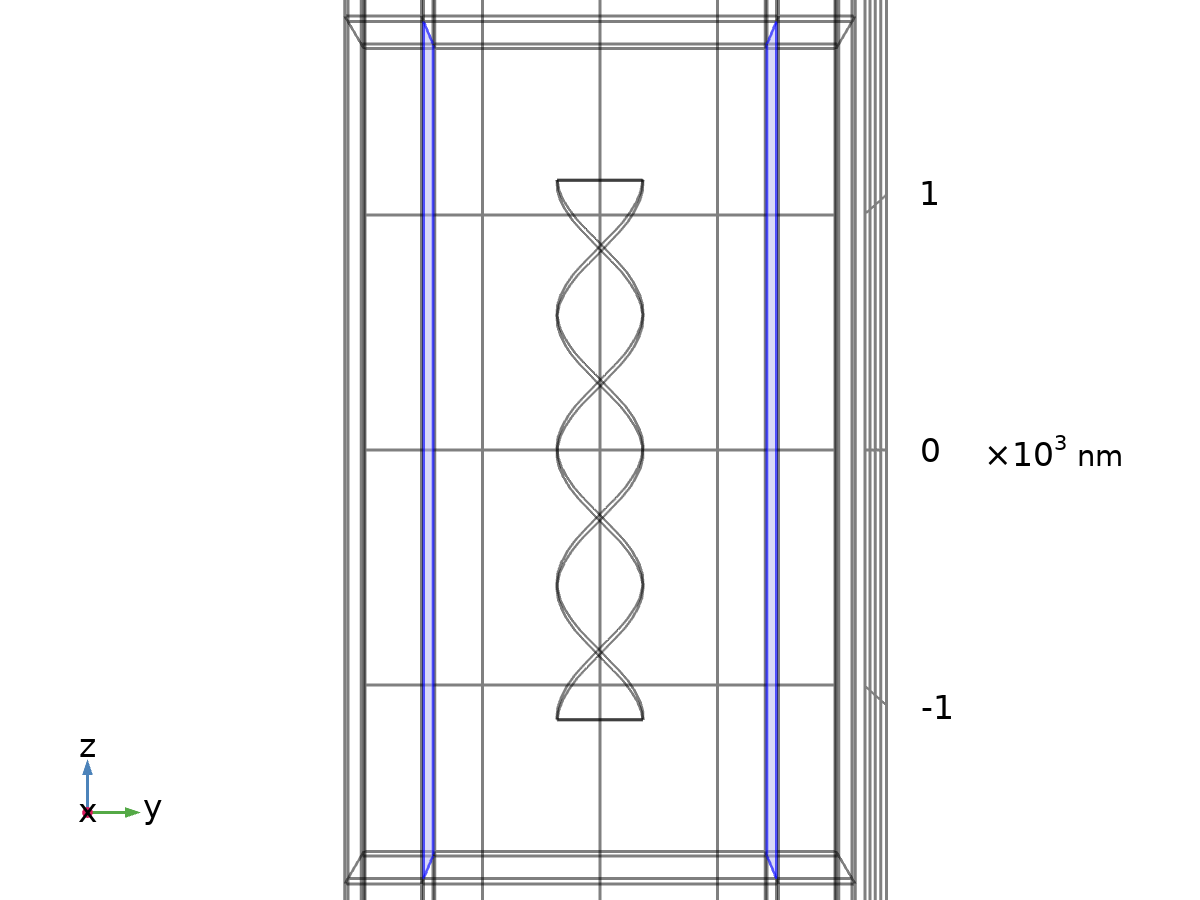
#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** |
| --- | --- | --- | --- | --- |
| ewfd.testtEx | test(ewfd.tEx) | V/m | Tangential electric field, x component | Boundary 47 |
| ewfd.testtEy | test(ewfd.tEy) | V/m | Tangential electric field, y component | Boundary 47 |
| ewfd.testtEz | test(ewfd.tEz) | V/m | Tangential electric field, z component | Boundary 47 |
| ewfd.testtEx | test(ewfd.tEx) | V/m | Tangential electric field, x component | Boundary 86 |
| ewfd.testtEy | test(ewfd.tEy) | V/m | Tangential electric field, y component | Boundary 86 |
| ewfd.testtEz | test(ewfd.tEz) | V/m | Tangential electric field, z component | Boundary 86 |
| ewfd.kFloquetx | ewfd.kPeriodicx | rad/m | k-vector for Floquet periodicity, x component | Boundary 47 |
| ewfd.kFloquety | ewfd.kPeriodicy | rad/m | k-vector for Floquet periodicity, y component | Boundary 47 |
| ewfd.kFloquetz | ewfd.kPeriodicz | rad/m | k-vector for Floquet periodicity, z component | Boundary 47 |
| ewfd.kFloquetx | ewfd.kPeriodicx | rad/m | k-vector for Floquet periodicity, x component | Boundary 86 |
| ewfd.kFloquety | ewfd.kPeriodicy | rad/m | k-vector for Floquet periodicity, y component | Boundary 86 |
| ewfd.kFloquetz | ewfd.kPeriodicz | rad/m | k-vector for Floquet periodicity, z component | Boundary 86 |
| ewfd.rsrcx\_pc1 | ewfd.src\_avg\_pc1(x) | m | Source origin, x component | Global |
| ewfd.rsrcy\_pc1 | ewfd.src\_avg\_pc1(y) | m | Source origin, y component | Global |
| ewfd.rsrcz\_pc1 | ewfd.src\_avg\_pc1(z) | m | Source origin, z component | Global |
| ewfd.rdstx\_pc1 | ewfd.dst\_avg\_pc1(x) | m | Destination origin, x component | Global |
| ewfd.rdsty\_pc1 | ewfd.dst\_avg\_pc1(y) | m | Destination origin, y component | Global |
| ewfd.rdstz\_pc1 | ewfd.dst\_avg\_pc1(z) | m | Destination origin, z component | Global |
| ewfd.incontact\_pc1 | ewfd.src2dst\_pc1 |  |  | Boundary 86 |
| ewfd.incontact\_pc1 | ewfd.dst2src\_pc1 |  |  | Boundary 47 |

#### Constraints

| **Constraint** | **Constraint force** | **Shape function** | **Selection** | **Details** |
| --- | --- | --- | --- | --- |
| if(ewfd.incontact\_pc1,ewfd.tEsdimx-ewfd.src2dst\_pc1(ewfd.tEsdimx)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)-ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)-ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | if(ewfd.incontact\_pc1,test(ewfd.tEsdimx)-ewfd.src2dst\_pc1(test(ewfd.tEsdimx))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)+ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)+ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | Curl (Quadratic) | Boundary 86 | Nodal |
| if(ewfd.incontact\_pc1,ewfd.tEsdimy-ewfd.src2dst\_pc1(ewfd.tEsdimy)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)-ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)-ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | if(ewfd.incontact\_pc1,test(ewfd.tEsdimy)-ewfd.src2dst\_pc1(test(ewfd.tEsdimy))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)+ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)+ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | Curl (Quadratic) | Boundary 86 | Nodal |
| if(ewfd.incontact\_pc1,ewfd.tEsdimz-ewfd.src2dst\_pc1(ewfd.tEsdimz)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)-ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)-ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | if(ewfd.incontact\_pc1,test(ewfd.tEsdimz)-ewfd.src2dst\_pc1(test(ewfd.tEsdimz))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc1-ewfd.rsrcx\_pc1)+ewfd.kFloquety\*(ewfd.rdsty\_pc1-ewfd.rsrcy\_pc1)+ewfd.kFloquetz\*(ewfd.rdstz\_pc1-ewfd.rsrcz\_pc1))),0) | Curl (Quadratic) | Boundary 86 | Nodal |

* + 1. Periodic Condition 2



Periodic Condition 2

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundaries 48, 58 |

Equations





#### Periodicity Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Type of periodicity | Floquet periodicity |
| k-vector for Floquet periodicity | From periodic port |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** |
| --- | --- | --- | --- | --- |
| ewfd.testtEx | test(ewfd.tEx) | V/m | Tangential electric field, x component | Boundary 48 |
| ewfd.testtEy | test(ewfd.tEy) | V/m | Tangential electric field, y component | Boundary 48 |
| ewfd.testtEz | test(ewfd.tEz) | V/m | Tangential electric field, z component | Boundary 48 |
| ewfd.testtEx | test(ewfd.tEx) | V/m | Tangential electric field, x component | Boundary 58 |
| ewfd.testtEy | test(ewfd.tEy) | V/m | Tangential electric field, y component | Boundary 58 |
| ewfd.testtEz | test(ewfd.tEz) | V/m | Tangential electric field, z component | Boundary 58 |
| ewfd.kFloquetx | ewfd.kPeriodicx | rad/m | k-vector for Floquet periodicity, x component | Boundary 48 |
| ewfd.kFloquety | ewfd.kPeriodicy | rad/m | k-vector for Floquet periodicity, y component | Boundary 48 |
| ewfd.kFloquetz | ewfd.kPeriodicz | rad/m | k-vector for Floquet periodicity, z component | Boundary 48 |
| ewfd.kFloquetx | ewfd.kPeriodicx | rad/m | k-vector for Floquet periodicity, x component | Boundary 58 |
| ewfd.kFloquety | ewfd.kPeriodicy | rad/m | k-vector for Floquet periodicity, y component | Boundary 58 |
| ewfd.kFloquetz | ewfd.kPeriodicz | rad/m | k-vector for Floquet periodicity, z component | Boundary 58 |
| ewfd.rsrcx\_pc2 | ewfd.src\_avg\_pc2(x) | m | Source origin, x component | Global |
| ewfd.rsrcy\_pc2 | ewfd.src\_avg\_pc2(y) | m | Source origin, y component | Global |
| ewfd.rsrcz\_pc2 | ewfd.src\_avg\_pc2(z) | m | Source origin, z component | Global |
| ewfd.rdstx\_pc2 | ewfd.dst\_avg\_pc2(x) | m | Destination origin, x component | Global |
| ewfd.rdsty\_pc2 | ewfd.dst\_avg\_pc2(y) | m | Destination origin, y component | Global |
| ewfd.rdstz\_pc2 | ewfd.dst\_avg\_pc2(z) | m | Destination origin, z component | Global |
| ewfd.incontact\_pc2 | ewfd.src2dst\_pc2 |  |  | Boundary 58 |
| ewfd.incontact\_pc2 | ewfd.dst2src\_pc2 |  |  | Boundary 48 |

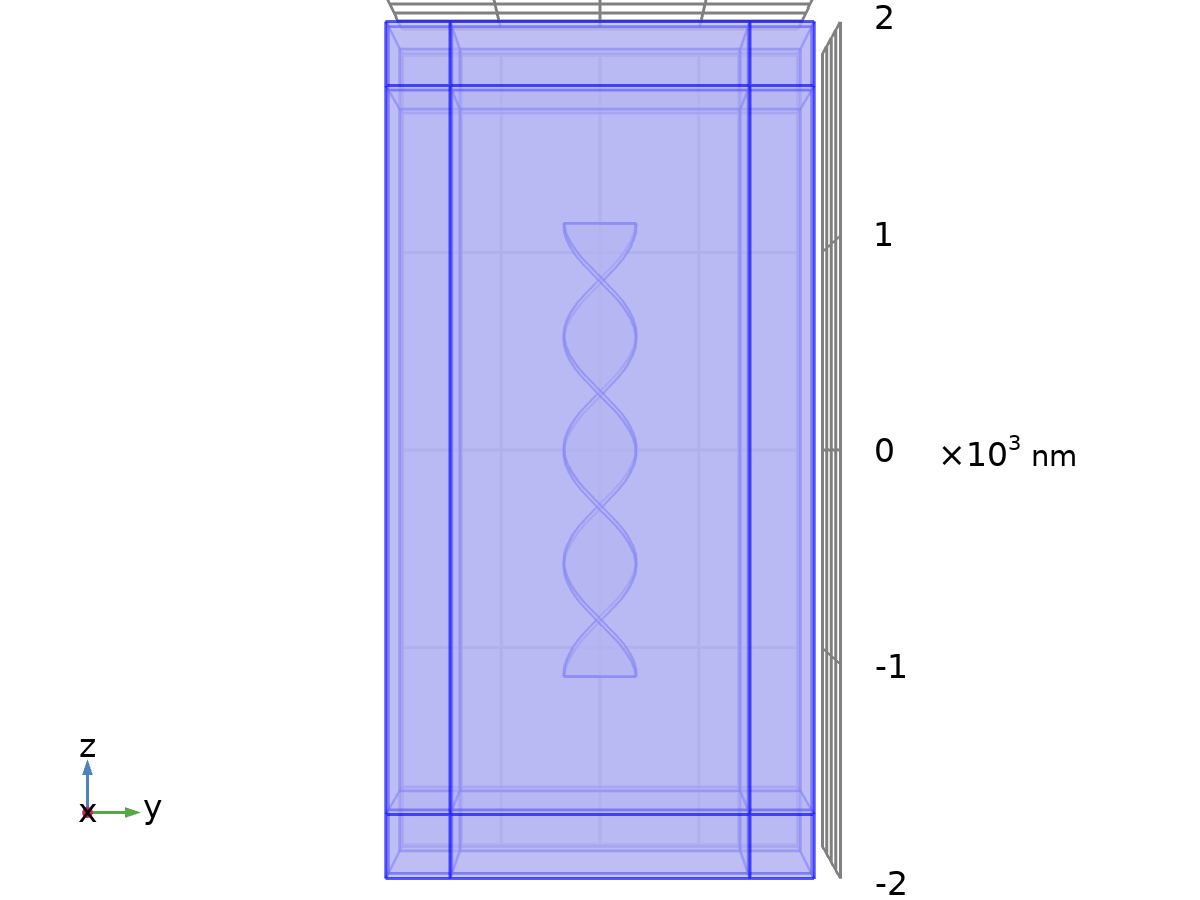
#### Constraints

| **Constraint** | **Constraint force** | **Shape function** | **Selection** | **Details** |
| --- | --- | --- | --- | --- |
| if(ewfd.incontact\_pc2,ewfd.tEsdimx-ewfd.src2dst\_pc2(ewfd.tEsdimx)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)-ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)-ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | if(ewfd.incontact\_pc2,test(ewfd.tEsdimx)-ewfd.src2dst\_pc2(test(ewfd.tEsdimx))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)+ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)+ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | Curl (Quadratic) | Boundary 58 | Nodal |
| if(ewfd.incontact\_pc2,ewfd.tEsdimy-ewfd.src2dst\_pc2(ewfd.tEsdimy)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)-ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)-ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | if(ewfd.incontact\_pc2,test(ewfd.tEsdimy)-ewfd.src2dst\_pc2(test(ewfd.tEsdimy))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)+ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)+ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | Curl (Quadratic) | Boundary 58 | Nodal |
| if(ewfd.incontact\_pc2,ewfd.tEsdimz-ewfd.src2dst\_pc2(ewfd.tEsdimz)\*exp(j\*(-ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)-ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)-ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | if(ewfd.incontact\_pc2,test(ewfd.tEsdimz)-ewfd.src2dst\_pc2(test(ewfd.tEsdimz))\*exp(j\*(ewfd.kFloquetx\*(ewfd.rdstx\_pc2-ewfd.rsrcx\_pc2)+ewfd.kFloquety\*(ewfd.rdsty\_pc2-ewfd.rsrcy\_pc2)+ewfd.kFloquetz\*(ewfd.rdstz\_pc2-ewfd.rsrcz\_pc2))),0) | Curl (Quadratic) | Boundary 58 | Nodal |

* 1. Electromagnetic Waves, Frequency Domain 2a

Used products

|  |
| --- |
| COMSOL Multiphysics |
| Wave Optics Module |

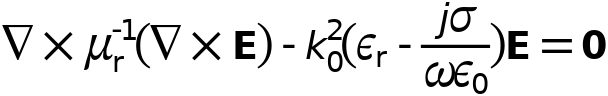


Electromagnetic Waves, Frequency Domain 2a

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

Equations



* + 1. Interface Settings

#### Discretization

Settings

| **Description** | **Value** |
| --- | --- |
| Electric field | Quadratic |

#### Formulation

Settings

| **Description** | **Value** |
| --- | --- |
|  | Scattered field |
| Background wave type | User defined |
| Background electric field, x component | ewfd.Ex |
| Background electric field, y component | ewfd.Ey |
| Background electric field, z component | ewfd.Ez |

#### Port Sweep Settings

Settings

| **Description** | **Value** |
| --- | --- |
| Use manual port sweep | Off |

#### Physics-Controlled Mesh

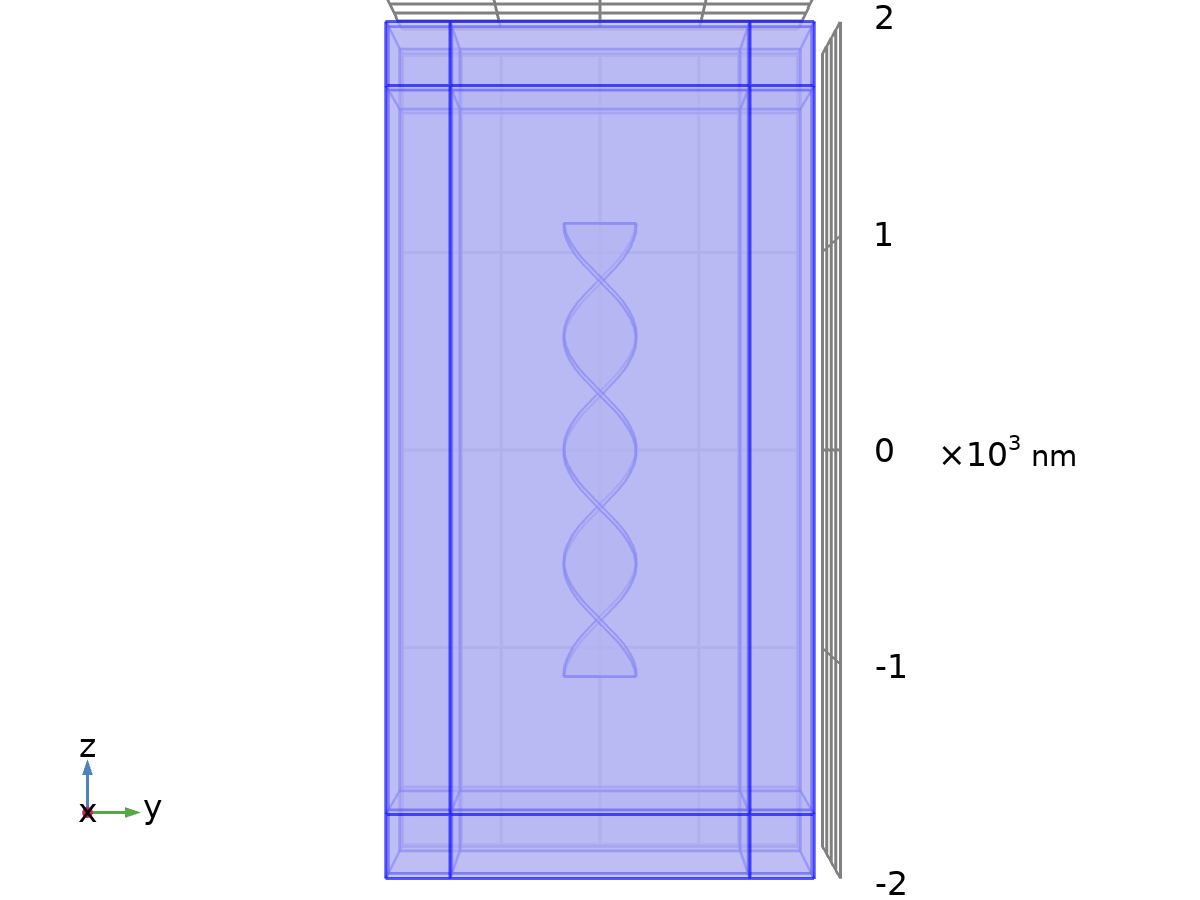
Settings

| **Description** | **Value** |
| --- | --- |
| Maximum mesh element size control parameter | From study |
| Resolve wave in lossy media | Off |

* + 1. Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd2.Ebx | ewfd.Ex\*!isScalingSystemDomain | V/m | Background electric field, x component | Domains 14, 19 |  |
| ewfd2.Eby | ewfd.Ey\*!isScalingSystemDomain | V/m | Background electric field, y component | Domains 14, 19 |  |
| ewfd2.Ebz | ewfd.Ez\*!isScalingSystemDomain | V/m | Background electric field, z component | Domains 14, 19 |  |
| ewfd2.Ebx | ewfd.Ex\*!isScalingSystemDomain | V/m | Background electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Eby | ewfd.Ey\*!isScalingSystemDomain | V/m | Background electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Ebz | ewfd.Ez\*!isScalingSystemDomain | V/m | Background electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Pbx | epsilon0\_const\*(ewfd2.epsilonrxx\*ewfd2.Ebx+ewfd2.epsilonrxy\*ewfd2.Eby+ewfd2.epsilonrxz\*ewfd2.Ebz-ewfd2.Ebx) | C/m² | Background polarization, x component | Domains 14, 19 |  |
| ewfd2.Pby | epsilon0\_const\*(ewfd2.epsilonryx\*ewfd2.Ebx+ewfd2.epsilonryy\*ewfd2.Eby+ewfd2.epsilonryz\*ewfd2.Ebz-ewfd2.Eby) | C/m² | Background polarization, y component | Domains 14, 19 |  |
| ewfd2.Pbz | epsilon0\_const\*(ewfd2.epsilonrzx\*ewfd2.Ebx+ewfd2.epsilonrzy\*ewfd2.Eby+ewfd2.epsilonrzz\*ewfd2.Ebz-ewfd2.Ebz) | C/m² | Background polarization, z component | Domains 14, 19 |  |
| ewfd2.Pbx | epsilon0\_const\*(ewfd2.epsilonrxx\*ewfd2.Ebx+ewfd2.epsilonrxy\*ewfd2.Eby+ewfd2.epsilonrxz\*ewfd2.Ebz-ewfd2.Ebx) | C/m² | Background polarization, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Pby | epsilon0\_const\*(ewfd2.epsilonryx\*ewfd2.Ebx+ewfd2.epsilonryy\*ewfd2.Eby+ewfd2.epsilonryz\*ewfd2.Ebz-ewfd2.Eby) | C/m² | Background polarization, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Pbz | epsilon0\_const\*(ewfd2.epsilonrzx\*ewfd2.Ebx+ewfd2.epsilonrzy\*ewfd2.Eby+ewfd2.epsilonrzz\*ewfd2.Ebz-ewfd2.Ebz) | C/m² | Background polarization, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Dbx | epsilon0\_const\*ewfd2.Ebx+ewfd2.Pbx | C/m² | Background electric displacement field, x component | Domains 14, 19 |  |
| ewfd2.Dby | epsilon0\_const\*ewfd2.Eby+ewfd2.Pby | C/m² | Background electric displacement field, y component | Domains 14, 19 |  |
| ewfd2.Dbz | epsilon0\_const\*ewfd2.Ebz+ewfd2.Pbz | C/m² | Background electric displacement field, z component | Domains 14, 19 |  |
| ewfd2.Dbx | epsilon0\_const\*ewfd2.Ebx+ewfd2.Pbx | C/m² | Background electric displacement field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Dby | epsilon0\_const\*ewfd2.Eby+ewfd2.Pby | C/m² | Background electric displacement field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Dbz | epsilon0\_const\*ewfd2.Ebz+ewfd2.Pbz | C/m² | Background electric displacement field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relDx | ewfd2.Dx-ewfd2.Dbx | C/m² | Relative electric displacement field, x component | Domains 14, 19 |  |
| ewfd2.relDy | ewfd2.Dy-ewfd2.Dby | C/m² | Relative electric displacement field, y component | Domains 14, 19 |  |
| ewfd2.relDz | ewfd2.Dz-ewfd2.Dbz | C/m² | Relative electric displacement field, z component | Domains 14, 19 |  |
| ewfd2.relDx | ewfd2.Dx-ewfd2.Dbx | C/m² | Relative electric displacement field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relDy | ewfd2.Dy-ewfd2.Dby | C/m² | Relative electric displacement field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relDz | ewfd2.Dz-ewfd2.Dbz | C/m² | Relative electric displacement field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bbx | -(d(ewfd2.Ebz,y)-d(ewfd2.Eby,z))/ewfd2.iomega | T | Background magnetic flux density, x component | Domains 14, 19 |  |
| ewfd2.Bby | -(-d(ewfd2.Ebz,x)+d(ewfd2.Ebx,z))/ewfd2.iomega | T | Background magnetic flux density, y component | Domains 14, 19 |  |
| ewfd2.Bbz | -(d(ewfd2.Eby,x)-d(ewfd2.Ebx,y))/ewfd2.iomega | T | Background magnetic flux density, z component | Domains 14, 19 |  |
| ewfd2.Bbx | -(d(ewfd2.Ebz,y)-d(ewfd2.Eby,z))/ewfd2.iomega | T | Background magnetic flux density, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bby | -(-d(ewfd2.Ebz,x)+d(ewfd2.Ebx,z))/ewfd2.iomega | T | Background magnetic flux density, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bbz | -(d(ewfd2.Eby,x)-d(ewfd2.Ebx,y))/ewfd2.iomega | T | Background magnetic flux density, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hbx | (ewfd2.murinvxx\*ewfd2.Bbx+ewfd2.murinvxy\*ewfd2.Bby+ewfd2.murinvxz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, x component | Domains 14, 19 |  |
| ewfd2.Hby | (ewfd2.murinvyx\*ewfd2.Bbx+ewfd2.murinvyy\*ewfd2.Bby+ewfd2.murinvyz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, y component | Domains 14, 19 |  |
| ewfd2.Hbz | (ewfd2.murinvzx\*ewfd2.Bbx+ewfd2.murinvzy\*ewfd2.Bby+ewfd2.murinvzz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, z component | Domains 14, 19 |  |
| ewfd2.Hbx | (ewfd2.murinvxx\*ewfd2.Bbx+ewfd2.murinvxy\*ewfd2.Bby+ewfd2.murinvxz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hby | (ewfd2.murinvyx\*ewfd2.Bbx+ewfd2.murinvyy\*ewfd2.Bby+ewfd2.murinvyz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hbz | (ewfd2.murinvzx\*ewfd2.Bbx+ewfd2.murinvzy\*ewfd2.Bby+ewfd2.murinvzz\*ewfd2.Bbz)/mu0\_const | A/m | Background magnetic field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relHx | ewfd2.Hx-ewfd2.Hbx | A/m | Relative magnetic field, x component | Domains 14, 19 |  |
| ewfd2.relHy | ewfd2.Hy-ewfd2.Hby | A/m | Relative magnetic field, y component | Domains 14, 19 |  |
| ewfd2.relHz | ewfd2.Hz-ewfd2.Hbz | A/m | Relative magnetic field, z component | Domains 14, 19 |  |
| ewfd2.relHx | ewfd2.Hx-ewfd2.Hbx | A/m | Relative magnetic field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relHy | ewfd2.Hy-ewfd2.Hby | A/m | Relative magnetic field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relHz | ewfd2.Hz-ewfd2.Hbz | A/m | Relative magnetic field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relBx | ewfd2.Bx-ewfd2.Bbx | T | Relative magnetic flux density, x component | Domains 14, 19 |  |
| ewfd2.relBy | ewfd2.By-ewfd2.Bby | T | Relative magnetic flux density, y component | Domains 14, 19 |  |
| ewfd2.relBz | ewfd2.Bz-ewfd2.Bbz | T | Relative magnetic flux density, z component | Domains 14, 19 |  |
| ewfd2.relBx | ewfd2.Bx-ewfd2.Bbx | T | Relative magnetic flux density, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relBy | ewfd2.By-ewfd2.Bby | T | Relative magnetic flux density, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relBz | ewfd2.Bz-ewfd2.Bbz | T | Relative magnetic flux density, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.kGaussian | ewfd2.k0 | rad/m | Wave number | Domains 14, 19 |  |
| ewfd2.kGaussian | ewfd2.k0 | rad/m | Wave number | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEbx | d(ewfd2.Ebz,y)-d(ewfd2.Eby,z) | V/m² | Curl of background electric field, x component | Domains 14, 19 |  |
| ewfd2.curlEby | -d(ewfd2.Ebz,x)+d(ewfd2.Ebx,z) | V/m² | Curl of background electric field, y component | Domains 14, 19 |  |
| ewfd2.curlEbz | d(ewfd2.Eby,x)-d(ewfd2.Ebx,y) | V/m² | Curl of background electric field, z component | Domains 14, 19 |  |
| ewfd2.curlEbx | d(ewfd2.Ebz,y)-d(ewfd2.Eby,z) | V/m² | Curl of background electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEby | -d(ewfd2.Ebz,x)+d(ewfd2.Ebx,z) | V/m² | Curl of background electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEbz | d(ewfd2.Eby,x)-d(ewfd2.Ebx,y) | V/m² | Curl of background electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.k0 | ewfd2.iomega\*sqrt(mu0\_const\*epsilon0\_const)/i | rad/m | Wave number in free space | Global |  |
| ewfd2.k | ewfd2.k0\*sqrt((ewfd2.murxx\*(ewfd2.epsilonrxx+ewfd2.sigmaxx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murxy\*(ewfd2.epsilonryx+ewfd2.sigmayx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murxz\*(ewfd2.epsilonrzx+ewfd2.sigmazx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryx\*(ewfd2.epsilonrxy+ewfd2.sigmaxy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryy\*(ewfd2.epsilonryy+ewfd2.sigmayy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryz\*(ewfd2.epsilonrzy+ewfd2.sigmazy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzx\*(ewfd2.epsilonrxz+ewfd2.sigmaxz/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzy\*(ewfd2.epsilonryz+ewfd2.sigmayz/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzz\*(ewfd2.epsilonrzz+ewfd2.sigmazz/(ewfd2.iomega\*epsilon0\_const)))/3) | rad/m | Wave number | Domains 14, 19 |  |
| ewfd2.k | ewfd2.k0\*sqrt((ewfd2.murxx\*(ewfd2.epsilonrxx+ewfd2.sigmaxx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murxy\*(ewfd2.epsilonryx+ewfd2.sigmayx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murxz\*(ewfd2.epsilonrzx+ewfd2.sigmazx/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryx\*(ewfd2.epsilonrxy+ewfd2.sigmaxy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryy\*(ewfd2.epsilonryy+ewfd2.sigmayy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.muryz\*(ewfd2.epsilonrzy+ewfd2.sigmazy/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzx\*(ewfd2.epsilonrxz+ewfd2.sigmaxz/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzy\*(ewfd2.epsilonryz+ewfd2.sigmayz/(ewfd2.iomega\*epsilon0\_const))+ewfd2.murzz\*(ewfd2.epsilonrzz+ewfd2.sigmazz/(ewfd2.iomega\*epsilon0\_const)))/3) | rad/m | Wave number | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Jsx | 0 | A/m | Surface current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jsy | 0 | A/m | Surface current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jsz | 0 | A/m | Surface current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jsx | 0 | A/m | Surface current density, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Jsy | 0 | A/m | Surface current density, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Jsz | 0 | A/m | Surface current density, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.normJs | sqrt(realdot(ewfd2.Jsx,ewfd2.Jsx)+realdot(ewfd2.Jsy,ewfd2.Jsy)+realdot(ewfd2.Jsz,ewfd2.Jsz)) | A/m | Surface current density norm | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.normJs | sqrt(realdot(ewfd2.Jsx,ewfd2.Jsx)+realdot(ewfd2.Jsy,ewfd2.Jsy)+realdot(ewfd2.Jsz,ewfd2.Jsz)) | A/m | Surface current density norm | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.intWe | ewfd2.integratewee(ewfd2.dWe) | J | Total electric energy | Global | + operation |
| ewfd2.intWm | ewfd2.integratewee(ewfd2.dWm) | J | Total magnetic energy | Global | + operation |
| ewfd2.lambda0 | c\_const/ewfd2.freq | m | Wavelength in free space | Global |  |
| ewfd2.nx | nx |  | Normal vector, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.ny | ny |  | Normal vector, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nz | nz |  | Normal vector, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nx | dnx |  | Normal vector, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.ny | dny |  | Normal vector, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nz | dnz |  | Normal vector, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nx | nx |  | Normal vector, x component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.ny | ny |  | Normal vector, y component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nz | nz |  | Normal vector, z component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nPMLx | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.unx+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dnx+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.nx | 1 | Normal vector, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nPMLy | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.uny+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dny+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.ny | 1 | Normal vector, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nPMLz | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.unz+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dnz+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.nz | 1 | Normal vector, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nPMLx | dnx | 1 | Normal vector, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nPMLy | dny | 1 | Normal vector, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nPMLz | dnz | 1 | Normal vector, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nPMLx | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.unx+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dnx+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.nx | 1 | Normal vector, x component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nPMLy | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.uny+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dny+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.ny | 1 | Normal vector, y component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nPMLz | down(isScalingSystemDomain)\*!up(isScalingSystemDomain)\*ewfd2.unz+up(isScalingSystemDomain)\*!down(isScalingSystemDomain)\*ewfd2.dnz+(down(isScalingSystemDomain)\*up(isScalingSystemDomain)+!down(isScalingSystemDomain)\*!up(isScalingSystemDomain))\*ewfd2.nz | 1 | Normal vector, z component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nmeshx | nxmesh |  | Normal vector (mesh), x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nmeshy | nymesh |  | Normal vector (mesh), y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nmeshz | nzmesh |  | Normal vector (mesh), z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nmeshx | dnxmesh |  | Normal vector (mesh), x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nmeshy | dnymesh |  | Normal vector (mesh), y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nmeshz | dnzmesh |  | Normal vector (mesh), z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.nmeshx | nxmesh |  | Normal vector (mesh), x component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nmeshy | nymesh |  | Normal vector (mesh), y component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.nmeshz | nzmesh |  | Normal vector (mesh), z component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 |  |
| ewfd2.unmeshx | unxmesh |  | Mesh normal vector, upside, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unmeshy | unymesh |  | Mesh normal vector, upside, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unmeshz | unzmesh |  | Mesh normal vector, upside, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unmeshx | unxmesh |  | Mesh normal vector, upside, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unmeshy | unymesh |  | Mesh normal vector, upside, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unmeshz | unzmesh |  | Mesh normal vector, upside, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnmeshx | dnxmesh |  | Mesh normal vector, downside, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnmeshy | dnymesh |  | Mesh normal vector, downside, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnmeshz | dnzmesh |  | Mesh normal vector, downside, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnmeshx | dnxmesh |  | Mesh normal vector, downside, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnmeshy | dnymesh |  | Mesh normal vector, downside, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnmeshz | dnzmesh |  | Mesh normal vector, downside, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEx | ewfd2.tEsdimx+ewfd2.Ebx-ewfd2.nx\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEy | ewfd2.tEsdimy+ewfd2.Eby-ewfd2.ny\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEz | ewfd2.tEsdimz+ewfd2.Ebz-ewfd2.nz\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEx | ewfd2.tEsdimx+ewfd2.Ebx-ewfd2.nx\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEy | ewfd2.tEsdimy+ewfd2.Eby-ewfd2.ny\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEz | ewfd2.tEsdimz+ewfd2.Ebz-ewfd2.nz\*(ewfd2.nx\*ewfd2.Ebx+ewfd2.ny\*ewfd2.Eby+ewfd2.nz\*ewfd2.Ebz) | V/m | Tangential electric field, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEx | ewfd2.tEsdimx+ewfd2.tx\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEy | ewfd2.tEsdimy+ewfd2.ty\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEz | ewfd2.tEsdimz+ewfd2.tz\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEx | ewfd2.tEsdimx+ewfd2.tx\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, x component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tEy | ewfd2.tEsdimy+ewfd2.ty\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, y component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tEz | ewfd2.tEsdimz+ewfd2.tz\*(ewfd2.tx\*ewfd2.Ebx+ewfd2.ty\*ewfd2.Eby+ewfd2.tz\*ewfd2.Ebz) | V/m | Tangential electric field, z component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tEsdimx | tEx | V/m | Tangential electric field, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEsdimy | tEy | V/m | Tangential electric field, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEsdimz | tEz | V/m | Tangential electric field, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tEsdimx | tEx | V/m | Tangential electric field, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEsdimy | tEy | V/m | Tangential electric field, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEsdimz | tEz | V/m | Tangential electric field, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tEsdimx | tEx | V/m | Tangential electric field, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEsdimy | tEy | V/m | Tangential electric field, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEsdimz | tEz | V/m | Tangential electric field, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tEsdimx | tEx | V/m | Tangential electric field, x component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tEsdimy | tEy | V/m | Tangential electric field, y component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tEsdimz | tEz | V/m | Tangential electric field, z component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.trelEx | ewfd2.tEsdimx | V/m | Tangential relative electric field, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.trelEy | ewfd2.tEsdimy | V/m | Tangential relative electric field, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.trelEz | ewfd2.tEsdimz | V/m | Tangential relative electric field, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.trelEx | ewfd2.tEsdimx | V/m | Tangential relative electric field, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.trelEy | ewfd2.tEsdimy | V/m | Tangential relative electric field, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.trelEz | ewfd2.tEsdimz | V/m | Tangential relative electric field, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.trelEx | ewfd2.tEsdimx | V/m | Tangential relative electric field, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.trelEy | ewfd2.tEsdimy | V/m | Tangential relative electric field, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.trelEz | ewfd2.tEsdimz | V/m | Tangential relative electric field, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.trelEx | ewfd2.tEsdimx | V/m | Tangential relative electric field, x component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.trelEy | ewfd2.tEsdimy | V/m | Tangential relative electric field, y component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.trelEz | ewfd2.tEsdimz | V/m | Tangential relative electric field, z component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tx | d(x,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, x component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.ty | d(y,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, y component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tz | d(z,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, z component | Edges 55–57, 59–60, 66, 68, 71, 81–92, 107–108, 111, 118 |  |
| ewfd2.tx | d(x,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, x component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.ty | d(y,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, y component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.tz | d(z,xi1)/sqrt(d(x,xi1)^2+d(y,xi1)^2+d(z,xi1)^2) |  | Tangential vector, z component | Edges 1–54, 58, 61–65, 67, 69–70, 72–80, 93–106, 109–110, 112–117, 119–156 |  |
| ewfd2.omega | 2\*pi\*ewfd2.freq | rad/s | Angular frequency | Global |  |
| ewfd2.freq | freq | Hz | Frequency | Global |  |
| ewfd2.iomega | ewfd2.omega\*i | rad/s | Complex angular frequency | Global |  |
| ewfd2.zref | 50[ohm] | Ω | Reference impedance | Global |  |

* + 1. Wave Equation, Electric 1

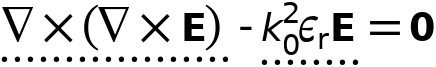


Wave Equation, Electric 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

Equations



#### Electric Displacement Field

Settings

| **Description** | **Value** |
| --- | --- |
| Electric displacement field model | Refractive index |
| Refractive index, real part | From material |
| Refractive index, imaginary part | From material |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

#### Model Input

Settings

| **Description** | **Value** |
| --- | --- |
| Frequency | User defined |
| Frequency | root.freq |
| Temperature | User defined |
| Temperature | 293.15[K] |

Properties from material

| **Property** | **Material** | **Property group** |
| --- | --- | --- |
| Refractive index, real part | Water, liquid | Refractive index |
| Refractive index, imaginary part | Water, liquid | Refractive index |
| Refractive index, real part | CdTe | Refractive index |
| Refractive index, imaginary part | CdTe | Refractive index |

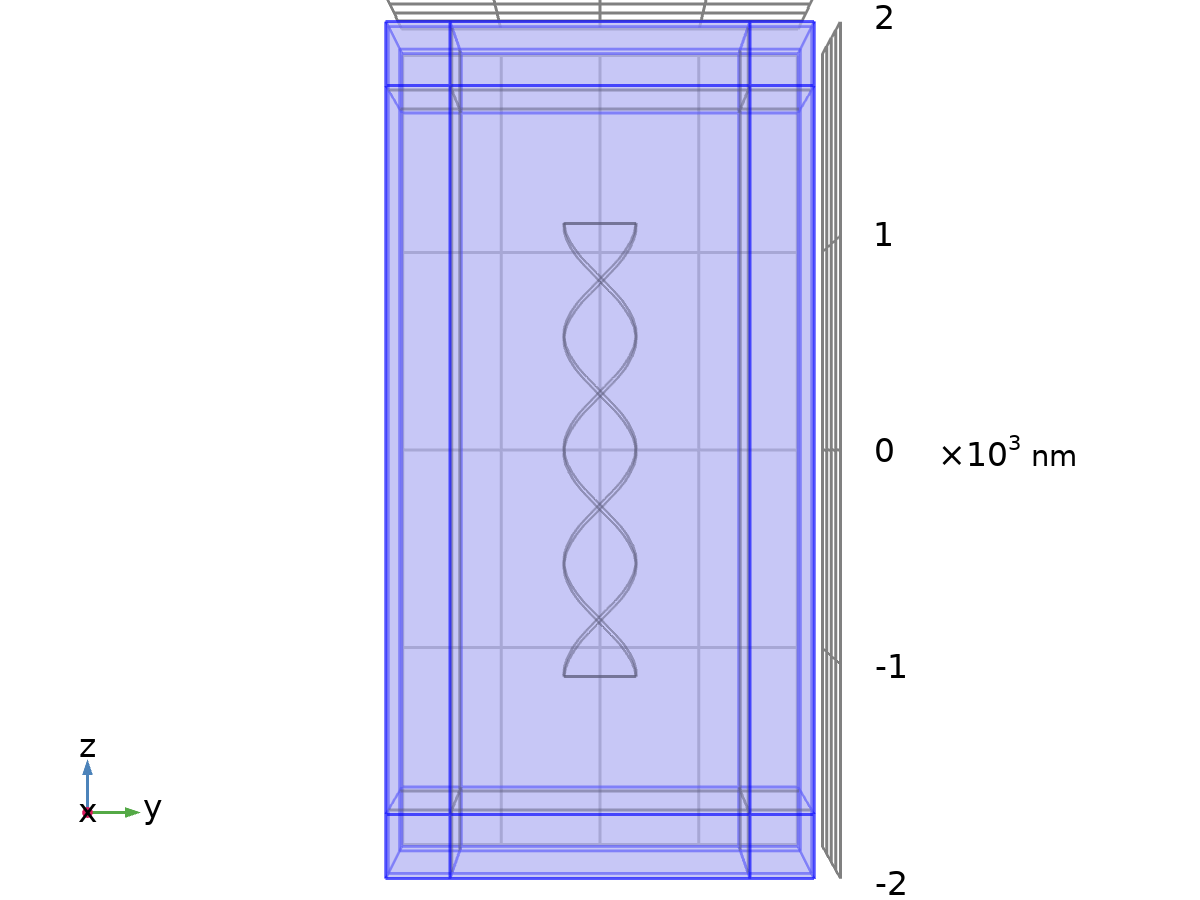
#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd2.Qsh | 0 | W/m² | Surface losses | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Qsh | 0 | W/m² | Surface losses | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Qe | ewfd2.Qml+ewfd2.Qrh | W/m³ | Electromagnetic power loss density | Domains 14, 19 | + operation |
| ewfd2.Qe | ewfd2.Qml+ewfd2.Qrh | W/m³ | Electromagnetic power loss density | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Qh | ewfd2.Qml+ewfd2.Qrh | W/m³ | Total power dissipation density | Domains 14, 19 | + operation |
| ewfd2.Qh | ewfd2.Qml+ewfd2.Qrh | W/m³ | Total power dissipation density | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jx | ewfd2.sigmaxx\*ewfd2.Ex+ewfd2.sigmaxy\*ewfd2.Ey+ewfd2.sigmaxz\*ewfd2.Ez+ewfd2.Jdx | A/m² | Current density, x component | Domains 14, 19 | + operation |
| ewfd2.Jy | ewfd2.sigmayx\*ewfd2.Ex+ewfd2.sigmayy\*ewfd2.Ey+ewfd2.sigmayz\*ewfd2.Ez+ewfd2.Jdy | A/m² | Current density, y component | Domains 14, 19 | + operation |
| ewfd2.Jz | ewfd2.sigmazx\*ewfd2.Ex+ewfd2.sigmazy\*ewfd2.Ey+ewfd2.sigmazz\*ewfd2.Ez+ewfd2.Jdz | A/m² | Current density, z component | Domains 14, 19 | + operation |
| ewfd2.Jx | ewfd2.sigmaxx\*ewfd2.Ex+ewfd2.sigmaxy\*ewfd2.Ey+ewfd2.sigmaxz\*ewfd2.Ez+ewfd2.Jdx | A/m² | Current density, x component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jy | ewfd2.sigmayx\*ewfd2.Ex+ewfd2.sigmayy\*ewfd2.Ey+ewfd2.sigmayz\*ewfd2.Ez+ewfd2.Jdy | A/m² | Current density, y component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jz | ewfd2.sigmazx\*ewfd2.Ex+ewfd2.sigmazy\*ewfd2.Ey+ewfd2.sigmazz\*ewfd2.Ez+ewfd2.Jdz | A/m² | Current density, z component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.tJx | 0 | A/m² | Tangential current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.tJy | 0 | A/m² | Tangential current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.tJz | 0 | A/m² | Tangential current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.tJx | 0 | A/m² | Tangential current density, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.tJy | 0 | A/m² | Tangential current density, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.tJz | 0 | A/m² | Tangential current density, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Wav | ewfd2.Weav+ewfd2.Wmav | J/m³ | Energy density time average | Domains 14, 19 | + operation |
| ewfd2.Wav | ewfd2.Weav+ewfd2.Wmav | J/m³ | Energy density time average | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.W | 0 | J/m³ | Energy density | Domains 14, 19 | + operation |
| ewfd2.W | 0 | J/m³ | Energy density | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jmsx | 0 | V/m | Surface magnetic current density, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jmsy | 0 | V/m | Surface magnetic current density, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jmsz | 0 | V/m | Surface magnetic current density, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.Jmsx | 0 | V/m | Surface magnetic current density, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Jmsy | 0 | V/m | Surface magnetic current density, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.Jmsz | 0 | V/m | Surface magnetic current density, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 | + operation |
| ewfd2.nxx | material.n11 | 1 | Refractive index, real part, xx component | Domains 14, 19 | Meta |
| ewfd2.nyx | material.n21 | 1 | Refractive index, real part, yx component | Domains 14, 19 | Meta |
| ewfd2.nzx | material.n31 | 1 | Refractive index, real part, zx component | Domains 14, 19 | Meta |
| ewfd2.nxy | material.n12 | 1 | Refractive index, real part, xy component | Domains 14, 19 | Meta |
| ewfd2.nyy | material.n22 | 1 | Refractive index, real part, yy component | Domains 14, 19 | Meta |
| ewfd2.nzy | material.n32 | 1 | Refractive index, real part, zy component | Domains 14, 19 | Meta |
| ewfd2.nxz | material.n13 | 1 | Refractive index, real part, xz component | Domains 14, 19 | Meta |
| ewfd2.nyz | material.n23 | 1 | Refractive index, real part, yz component | Domains 14, 19 | Meta |
| ewfd2.nzz | material.n33 | 1 | Refractive index, real part, zz component | Domains 14, 19 | Meta |
| ewfd2.nxx | material.n11 | 1 | Refractive index, real part, xx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nyx | material.n21 | 1 | Refractive index, real part, yx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nzx | material.n31 | 1 | Refractive index, real part, zx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nxy | material.n12 | 1 | Refractive index, real part, xy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nyy | material.n22 | 1 | Refractive index, real part, yy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nzy | material.n32 | 1 | Refractive index, real part, zy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nxz | material.n13 | 1 | Refractive index, real part, xz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nyz | material.n23 | 1 | Refractive index, real part, yz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.nzz | material.n33 | 1 | Refractive index, real part, zz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.n\_iso | material.n\_iso | 1 | Refractive index, real part, isotropic value | Domains 14, 19 | Meta |
| ewfd2.n\_iso | material.n\_iso | 1 | Refractive index, real part, isotropic value | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kixx | material.ki11 | 1 | Refractive index, imaginary part, xx component | Domains 14, 19 | Meta |
| ewfd2.kiyx | material.ki21 | 1 | Refractive index, imaginary part, yx component | Domains 14, 19 | Meta |
| ewfd2.kizx | material.ki31 | 1 | Refractive index, imaginary part, zx component | Domains 14, 19 | Meta |
| ewfd2.kixy | material.ki12 | 1 | Refractive index, imaginary part, xy component | Domains 14, 19 | Meta |
| ewfd2.kiyy | material.ki22 | 1 | Refractive index, imaginary part, yy component | Domains 14, 19 | Meta |
| ewfd2.kizy | material.ki32 | 1 | Refractive index, imaginary part, zy component | Domains 14, 19 | Meta |
| ewfd2.kixz | material.ki13 | 1 | Refractive index, imaginary part, xz component | Domains 14, 19 | Meta |
| ewfd2.kiyz | material.ki23 | 1 | Refractive index, imaginary part, yz component | Domains 14, 19 | Meta |
| ewfd2.kizz | material.ki33 | 1 | Refractive index, imaginary part, zz component | Domains 14, 19 | Meta |
| ewfd2.kixx | material.ki11 | 1 | Refractive index, imaginary part, xx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kiyx | material.ki21 | 1 | Refractive index, imaginary part, yx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kizx | material.ki31 | 1 | Refractive index, imaginary part, zx component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kixy | material.ki12 | 1 | Refractive index, imaginary part, xy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kiyy | material.ki22 | 1 | Refractive index, imaginary part, yy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kizy | material.ki32 | 1 | Refractive index, imaginary part, zy component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kixz | material.ki13 | 1 | Refractive index, imaginary part, xz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kiyz | material.ki23 | 1 | Refractive index, imaginary part, yz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.kizz | material.ki33 | 1 | Refractive index, imaginary part, zz component | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.ki\_iso | material.ki\_iso | 1 | Refractive index, imaginary part, isotropic value | Domains 14, 19 | Meta |
| ewfd2.ki\_iso | material.ki\_iso | 1 | Refractive index, imaginary part, isotropic value | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.epsilonrxx | ewfd2.epsilonrmxx | 1 | Relative permittivity, xx component | Domains 14, 19 |  |
| ewfd2.epsilonryx | ewfd2.epsilonrmyx | 1 | Relative permittivity, yx component | Domains 14, 19 |  |
| ewfd2.epsilonrzx | ewfd2.epsilonrmzx | 1 | Relative permittivity, zx component | Domains 14, 19 |  |
| ewfd2.epsilonrxy | ewfd2.epsilonrmxy | 1 | Relative permittivity, xy component | Domains 14, 19 |  |
| ewfd2.epsilonryy | ewfd2.epsilonrmyy | 1 | Relative permittivity, yy component | Domains 14, 19 |  |
| ewfd2.epsilonrzy | ewfd2.epsilonrmzy | 1 | Relative permittivity, zy component | Domains 14, 19 |  |
| ewfd2.epsilonrxz | ewfd2.epsilonrmxz | 1 | Relative permittivity, xz component | Domains 14, 19 |  |
| ewfd2.epsilonryz | ewfd2.epsilonrmyz | 1 | Relative permittivity, yz component | Domains 14, 19 |  |
| ewfd2.epsilonrzz | ewfd2.epsilonrmzz | 1 | Relative permittivity, zz component | Domains 14, 19 |  |
| ewfd2.epsilonrxx | ewfd2.epsilonrmxx | 1 | Relative permittivity, xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonryx | ewfd2.epsilonrmyx | 1 | Relative permittivity, yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrzx | ewfd2.epsilonrmzx | 1 | Relative permittivity, zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrxy | ewfd2.epsilonrmxy | 1 | Relative permittivity, xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonryy | ewfd2.epsilonrmyy | 1 | Relative permittivity, yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrzy | ewfd2.epsilonrmzy | 1 | Relative permittivity, zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrxz | ewfd2.epsilonrmxz | 1 | Relative permittivity, xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonryz | ewfd2.epsilonrmyz | 1 | Relative permittivity, yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrzz | ewfd2.epsilonrmzz | 1 | Relative permittivity, zz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmxx | (ewfd2.nxx-i\*ewfd2.kixx)^2+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, xx component | Domains 14, 19 |  |
| ewfd2.epsilonrmyx | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxx-i\*ewfd2.kixx)+(ewfd2.nyy-i\*ewfd2.kiyy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, yx component | Domains 14, 19 |  |
| ewfd2.epsilonrmzx | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxx-i\*ewfd2.kixx)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nzz-i\*ewfd2.kizz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, zx component | Domains 14, 19 |  |
| ewfd2.epsilonrmxy | (ewfd2.nxx-i\*ewfd2.kixx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyy-i\*ewfd2.kiyy)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, xy component | Domains 14, 19 |  |
| ewfd2.epsilonrmyy | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nyy-i\*ewfd2.kiyy)^2+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, yy component | Domains 14, 19 |  |
| ewfd2.epsilonrmzy | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyy-i\*ewfd2.kiyy)+(ewfd2.nzz-i\*ewfd2.kizz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, zy component | Domains 14, 19 |  |
| ewfd2.epsilonrmxz | (ewfd2.nxx-i\*ewfd2.kixx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzz-i\*ewfd2.kizz) | 1 | Relative permittivity, xz component | Domains 14, 19 |  |
| ewfd2.epsilonrmyz | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nyy-i\*ewfd2.kiyy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzz-i\*ewfd2.kizz) | 1 | Relative permittivity, yz component | Domains 14, 19 |  |
| ewfd2.epsilonrmzz | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nzz-i\*ewfd2.kizz)^2 | 1 | Relative permittivity, zz component | Domains 14, 19 |  |
| ewfd2.epsilonrmxx | (ewfd2.nxx-i\*ewfd2.kixx)^2+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmyx | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxx-i\*ewfd2.kixx)+(ewfd2.nyy-i\*ewfd2.kiyy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmzx | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxx-i\*ewfd2.kixx)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyx-i\*ewfd2.kiyx)+(ewfd2.nzz-i\*ewfd2.kizz)\*(ewfd2.nzx-i\*ewfd2.kizx) | 1 | Relative permittivity, zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmxy | (ewfd2.nxx-i\*ewfd2.kixx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyy-i\*ewfd2.kiyy)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmyy | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nyy-i\*ewfd2.kiyy)^2+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmzy | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxy-i\*ewfd2.kixy)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyy-i\*ewfd2.kiyy)+(ewfd2.nzz-i\*ewfd2.kizz)\*(ewfd2.nzy-i\*ewfd2.kizy) | 1 | Relative permittivity, zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmxz | (ewfd2.nxx-i\*ewfd2.kixx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nxy-i\*ewfd2.kixy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nxz-i\*ewfd2.kixz)\*(ewfd2.nzz-i\*ewfd2.kizz) | 1 | Relative permittivity, xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmyz | (ewfd2.nyx-i\*ewfd2.kiyx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nyy-i\*ewfd2.kiyy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nyz-i\*ewfd2.kiyz)\*(ewfd2.nzz-i\*ewfd2.kizz) | 1 | Relative permittivity, yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonrmzz | (ewfd2.nzx-i\*ewfd2.kizx)\*(ewfd2.nxz-i\*ewfd2.kixz)+(ewfd2.nzy-i\*ewfd2.kizy)\*(ewfd2.nyz-i\*ewfd2.kiyz)+(ewfd2.nzz-i\*ewfd2.kizz)^2 | 1 | Relative permittivity, zz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Px | epsilon0\_const\*(ewfd2.epsilonrxx\*ewfd2.Ex+ewfd2.epsilonrxy\*ewfd2.Ey+ewfd2.epsilonrxz\*ewfd2.Ez-ewfd2.Ex) | C/m² | Polarization, x component | Domains 14, 19 | + operation |
| ewfd2.Py | epsilon0\_const\*(ewfd2.epsilonryx\*ewfd2.Ex+ewfd2.epsilonryy\*ewfd2.Ey+ewfd2.epsilonryz\*ewfd2.Ez-ewfd2.Ey) | C/m² | Polarization, y component | Domains 14, 19 | + operation |
| ewfd2.Pz | epsilon0\_const\*(ewfd2.epsilonrzx\*ewfd2.Ex+ewfd2.epsilonrzy\*ewfd2.Ey+ewfd2.epsilonrzz\*ewfd2.Ez-ewfd2.Ez) | C/m² | Polarization, z component | Domains 14, 19 | + operation |
| ewfd2.Px | epsilon0\_const\*(ewfd2.epsilonrxx\*ewfd2.Ex+ewfd2.epsilonrxy\*ewfd2.Ey+ewfd2.epsilonrxz\*ewfd2.Ez-ewfd2.Ex) | C/m² | Polarization, x component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Py | epsilon0\_const\*(ewfd2.epsilonryx\*ewfd2.Ex+ewfd2.epsilonryy\*ewfd2.Ey+ewfd2.epsilonryz\*ewfd2.Ez-ewfd2.Ey) | C/m² | Polarization, y component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Pz | epsilon0\_const\*(ewfd2.epsilonrzx\*ewfd2.Ex+ewfd2.epsilonrzy\*ewfd2.Ey+ewfd2.epsilonrzz\*ewfd2.Ez-ewfd2.Ez) | C/m² | Polarization, z component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.normP | sqrt(realdot(ewfd2.Px,ewfd2.Px)+realdot(ewfd2.Py,ewfd2.Py)+realdot(ewfd2.Pz,ewfd2.Pz)) | C/m² | Polarization norm | Domains 14, 19 |  |
| ewfd2.normP | sqrt(realdot(ewfd2.Px,ewfd2.Px)+realdot(ewfd2.Py,ewfd2.Py)+realdot(ewfd2.Pz,ewfd2.Pz)) | C/m² | Polarization norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Dx | epsilon0\_const\*ewfd2.Ex+ewfd2.Px | C/m² | Electric displacement field, x component | Domains 14, 19 | + operation |
| ewfd2.Dy | epsilon0\_const\*ewfd2.Ey+ewfd2.Py | C/m² | Electric displacement field, y component | Domains 14, 19 | + operation |
| ewfd2.Dz | epsilon0\_const\*ewfd2.Ez+ewfd2.Pz | C/m² | Electric displacement field, z component | Domains 14, 19 | + operation |
| ewfd2.Dx | epsilon0\_const\*ewfd2.Ex+ewfd2.Px | C/m² | Electric displacement field, x component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Dy | epsilon0\_const\*ewfd2.Ey+ewfd2.Py | C/m² | Electric displacement field, y component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Dz | epsilon0\_const\*ewfd2.Ez+ewfd2.Pz | C/m² | Electric displacement field, z component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.normD | sqrt(realdot(ewfd2.Dx,ewfd2.Dx)+realdot(ewfd2.Dy,ewfd2.Dy)+realdot(ewfd2.Dz,ewfd2.Dz)) | C/m² | Electric displacement field norm | Domains 14, 19 |  |
| ewfd2.normD | sqrt(realdot(ewfd2.Dx,ewfd2.Dx)+realdot(ewfd2.Dy,ewfd2.Dy)+realdot(ewfd2.Dz,ewfd2.Dz)) | C/m² | Electric displacement field norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsrAv | (ewfd2.epsilonrxx+ewfd2.epsilonryy+ewfd2.epsilonrzz)/3 | 1 | Relative permittivity, average | Domains 14, 19 |  |
| ewfd2.epsrAv | (ewfd2.epsilonrxx+ewfd2.epsilonryy+ewfd2.epsilonrzz)/3 | 1 | Relative permittivity, average | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murxx | 1 | 1 | Relative permeability, xx component | Domains 14, 19 |  |
| ewfd2.muryx | 0 | 1 | Relative permeability, yx component | Domains 14, 19 |  |
| ewfd2.murzx | 0 | 1 | Relative permeability, zx component | Domains 14, 19 |  |
| ewfd2.murxy | 0 | 1 | Relative permeability, xy component | Domains 14, 19 |  |
| ewfd2.muryy | 1 | 1 | Relative permeability, yy component | Domains 14, 19 |  |
| ewfd2.murzy | 0 | 1 | Relative permeability, zy component | Domains 14, 19 |  |
| ewfd2.murxz | 0 | 1 | Relative permeability, xz component | Domains 14, 19 |  |
| ewfd2.muryz | 0 | 1 | Relative permeability, yz component | Domains 14, 19 |  |
| ewfd2.murzz | 1 | 1 | Relative permeability, zz component | Domains 14, 19 |  |
| ewfd2.murxx | 1 | 1 | Relative permeability, xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.muryx | 0 | 1 | Relative permeability, yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murzx | 0 | 1 | Relative permeability, zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murxy | 0 | 1 | Relative permeability, xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.muryy | 1 | 1 | Relative permeability, yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murzy | 0 | 1 | Relative permeability, zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murxz | 0 | 1 | Relative permeability, xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.muryz | 0 | 1 | Relative permeability, yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murzz | 1 | 1 | Relative permeability, zz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murAv | (ewfd2.murxx+ewfd2.muryy+ewfd2.murzz)/3 | 1 | Relative permeability, average | Domains 14, 19 |  |
| ewfd2.murAv | (ewfd2.murxx+ewfd2.muryy+ewfd2.murzz)/3 | 1 | Relative permeability, average | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmaxx | 0 | S/m | Electrical conductivity, xx component | Domains 14, 19 |  |
| ewfd2.sigmayx | 0 | S/m | Electrical conductivity, yx component | Domains 14, 19 |  |
| ewfd2.sigmazx | 0 | S/m | Electrical conductivity, zx component | Domains 14, 19 |  |
| ewfd2.sigmaxy | 0 | S/m | Electrical conductivity, xy component | Domains 14, 19 |  |
| ewfd2.sigmayy | 0 | S/m | Electrical conductivity, yy component | Domains 14, 19 |  |
| ewfd2.sigmazy | 0 | S/m | Electrical conductivity, zy component | Domains 14, 19 |  |
| ewfd2.sigmaxz | 0 | S/m | Electrical conductivity, xz component | Domains 14, 19 |  |
| ewfd2.sigmayz | 0 | S/m | Electrical conductivity, yz component | Domains 14, 19 |  |
| ewfd2.sigmazz | 0 | S/m | Electrical conductivity, zz component | Domains 14, 19 |  |
| ewfd2.sigmaxx | 0 | S/m | Electrical conductivity, xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmayx | 0 | S/m | Electrical conductivity, yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmazx | 0 | S/m | Electrical conductivity, zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmaxy | 0 | S/m | Electrical conductivity, xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmayy | 0 | S/m | Electrical conductivity, yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmazy | 0 | S/m | Electrical conductivity, zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmaxz | 0 | S/m | Electrical conductivity, xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmayz | 0 | S/m | Electrical conductivity, yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.sigmazz | 0 | S/m | Electrical conductivity, zz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Ex | ewfd2.relEx+ewfd2.Ebx | V/m | Electric field, x component | Domains 14, 19 |  |
| ewfd2.Ey | ewfd2.relEy+ewfd2.Eby | V/m | Electric field, y component | Domains 14, 19 |  |
| ewfd2.Ez | ewfd2.relEz+ewfd2.Ebz | V/m | Electric field, z component | Domains 14, 19 |  |
| ewfd2.Ex | ewfd2.relEx+ewfd2.Ebx | V/m | Electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Ey | ewfd2.relEy+ewfd2.Eby | V/m | Electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Ez | ewfd2.relEz+ewfd2.Ebz | V/m | Electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEx | curlEx+ewfd2.curlEbx | V/m² | Curl of electric field, x component | Domains 14, 19 |  |
| ewfd2.curlEy | curlEy+ewfd2.curlEby | V/m² | Curl of electric field, y component | Domains 14, 19 |  |
| ewfd2.curlEz | curlEz+ewfd2.curlEbz | V/m² | Curl of electric field, z component | Domains 14, 19 |  |
| ewfd2.curlEx | pml1.invT11\*curlEx/pml1.detInvT+pml1.invT21\*curlEy/pml1.detInvT+pml1.invT31\*curlEz/pml1.detInvT+ewfd2.curlEbx | V/m² | Curl of electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEy | pml1.invT12\*curlEx/pml1.detInvT+pml1.invT22\*curlEy/pml1.detInvT+pml1.invT32\*curlEz/pml1.detInvT+ewfd2.curlEby | V/m² | Curl of electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curlEz | pml1.invT13\*curlEx/pml1.detInvT+pml1.invT23\*curlEy/pml1.detInvT+pml1.invT33\*curlEz/pml1.detInvT+ewfd2.curlEbz | V/m² | Curl of electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.testdepEx | test(Ex) | V/m | Electric field, x component | Domains 14, 19 |  |
| ewfd2.testdepEy | test(Ey) | V/m | Electric field, y component | Domains 14, 19 |  |
| ewfd2.testdepEz | test(Ez) | V/m | Electric field, z component | Domains 14, 19 |  |
| ewfd2.testdepEx | pml1.T11\*test(Ex)+pml1.T12\*test(Ey)+pml1.T13\*test(Ez) | V/m | Electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.testdepEy | pml1.T21\*test(Ex)+pml1.T22\*test(Ey)+pml1.T23\*test(Ez) | V/m | Electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.testdepEz | pml1.T31\*test(Ex)+pml1.T32\*test(Ey)+pml1.T33\*test(Ez) | V/m | Electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curltestdepEx | test(curlEx) | V/m² | Curl of electric field, x component | Domains 14, 19 |  |
| ewfd2.curltestdepEy | test(curlEy) | V/m² | Curl of electric field, y component | Domains 14, 19 |  |
| ewfd2.curltestdepEz | test(curlEz) | V/m² | Curl of electric field, z component | Domains 14, 19 |  |
| ewfd2.curltestdepEx | (pml1.invT11\*test(curlEx)+pml1.invT21\*test(curlEy)+pml1.invT31\*test(curlEz))/pml1.detInvT | V/m² | Curl of electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curltestdepEy | (pml1.invT12\*test(curlEx)+pml1.invT22\*test(curlEy)+pml1.invT32\*test(curlEz))/pml1.detInvT | V/m² | Curl of electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.curltestdepEz | (pml1.invT13\*test(curlEx)+pml1.invT23\*test(curlEy)+pml1.invT33\*test(curlEz))/pml1.detInvT | V/m² | Curl of electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relEx | Ex | V/m | Relative electric field, x component | Domains 14, 19 |  |
| ewfd2.relEy | Ey | V/m | Relative electric field, y component | Domains 14, 19 |  |
| ewfd2.relEz | Ez | V/m | Relative electric field, z component | Domains 14, 19 |  |
| ewfd2.relEx | pml1.T11\*Ex+pml1.T12\*Ey+pml1.T13\*Ez | V/m | Relative electric field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relEy | pml1.T21\*Ex+pml1.T22\*Ey+pml1.T23\*Ez | V/m | Relative electric field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relEz | pml1.T31\*Ex+pml1.T32\*Ey+pml1.T33\*Ez | V/m | Relative electric field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dBdtx | -ewfd2.curlEx | V/m² | Magnetic flux density, time derivative, x component | Domains 14, 19 |  |
| ewfd2.dBdty | -ewfd2.curlEy | V/m² | Magnetic flux density, time derivative, y component | Domains 14, 19 |  |
| ewfd2.dBdtz | -ewfd2.curlEz | V/m² | Magnetic flux density, time derivative, z component | Domains 14, 19 |  |
| ewfd2.dBdtx | -ewfd2.curlEx | V/m² | Magnetic flux density, time derivative, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dBdty | -ewfd2.curlEy | V/m² | Magnetic flux density, time derivative, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dBdtz | -ewfd2.curlEz | V/m² | Magnetic flux density, time derivative, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bx | -ewfd2.curlEx/ewfd2.iomega | T | Magnetic flux density, x component | Domains 14, 19 |  |
| ewfd2.By | -ewfd2.curlEy/ewfd2.iomega | T | Magnetic flux density, y component | Domains 14, 19 |  |
| ewfd2.Bz | -ewfd2.curlEz/ewfd2.iomega | T | Magnetic flux density, z component | Domains 14, 19 |  |
| ewfd2.Bx | -ewfd2.curlEx/ewfd2.iomega | T | Magnetic flux density, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.By | -ewfd2.curlEy/ewfd2.iomega | T | Magnetic flux density, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bz | -ewfd2.curlEz/ewfd2.iomega | T | Magnetic flux density, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvxx | (ewfd2.muryy\*ewfd2.murzz-ewfd2.muryz\*ewfd2.murzy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xx component | Domains 14, 19 |  |
| ewfd2.murinvyx | (ewfd2.muryz\*ewfd2.murzx-ewfd2.muryx\*ewfd2.murzz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yx component | Domains 14, 19 |  |
| ewfd2.murinvzx | (ewfd2.muryx\*ewfd2.murzy-ewfd2.muryy\*ewfd2.murzx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zx component | Domains 14, 19 |  |
| ewfd2.murinvxy | (ewfd2.murxz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.murzz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xy component | Domains 14, 19 |  |
| ewfd2.murinvyy | (ewfd2.murxx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.murzx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yy component | Domains 14, 19 |  |
| ewfd2.murinvzy | (ewfd2.murxy\*ewfd2.murzx-ewfd2.murxx\*ewfd2.murzy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zy component | Domains 14, 19 |  |
| ewfd2.murinvxz | (ewfd2.murxy\*ewfd2.muryz-ewfd2.murxz\*ewfd2.muryy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xz component | Domains 14, 19 |  |
| ewfd2.murinvyz | (ewfd2.murxz\*ewfd2.muryx-ewfd2.murxx\*ewfd2.muryz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yz component | Domains 14, 19 |  |
| ewfd2.murinvzz | (ewfd2.murxx\*ewfd2.muryy-ewfd2.murxy\*ewfd2.muryx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zz component | Domains 14, 19 |  |
| ewfd2.murinvxx | (ewfd2.muryy\*ewfd2.murzz-ewfd2.muryz\*ewfd2.murzy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvyx | (ewfd2.muryz\*ewfd2.murzx-ewfd2.muryx\*ewfd2.murzz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvzx | (ewfd2.muryx\*ewfd2.murzy-ewfd2.muryy\*ewfd2.murzx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvxy | (ewfd2.murxz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.murzz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvyy | (ewfd2.murxx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.murzx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvzy | (ewfd2.murxy\*ewfd2.murzx-ewfd2.murxx\*ewfd2.murzy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvxz | (ewfd2.murxy\*ewfd2.muryz-ewfd2.murxz\*ewfd2.muryy)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvyz | (ewfd2.murxz\*ewfd2.muryx-ewfd2.murxx\*ewfd2.muryz)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.murinvzz | (ewfd2.murxx\*ewfd2.muryy-ewfd2.murxy\*ewfd2.muryx)/(ewfd2.murxx\*ewfd2.muryy\*ewfd2.murzz+ewfd2.murxy\*ewfd2.muryz\*ewfd2.murzx+ewfd2.murxz\*ewfd2.muryx\*ewfd2.murzy-ewfd2.murxx\*ewfd2.muryz\*ewfd2.murzy-ewfd2.murxy\*ewfd2.muryx\*ewfd2.murzz-ewfd2.murxz\*ewfd2.muryy\*ewfd2.murzx) | 1 | Inverse of relative permeability, zz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hx | (ewfd2.murinvxx\*ewfd2.Bx+ewfd2.murinvxy\*ewfd2.By+ewfd2.murinvxz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, x component | Domains 14, 19 |  |
| ewfd2.Hy | (ewfd2.murinvyx\*ewfd2.Bx+ewfd2.murinvyy\*ewfd2.By+ewfd2.murinvyz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, y component | Domains 14, 19 |  |
| ewfd2.Hz | (ewfd2.murinvzx\*ewfd2.Bx+ewfd2.murinvzy\*ewfd2.By+ewfd2.murinvzz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, z component | Domains 14, 19 |  |
| ewfd2.Hx | (ewfd2.murinvxx\*ewfd2.Bx+ewfd2.murinvxy\*ewfd2.By+ewfd2.murinvxz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hy | (ewfd2.murinvyx\*ewfd2.Bx+ewfd2.murinvyy\*ewfd2.By+ewfd2.murinvyz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Hz | (ewfd2.murinvzx\*ewfd2.Bx+ewfd2.murinvzy\*ewfd2.By+ewfd2.murinvzz\*ewfd2.Bz)/mu0\_const | A/m | Magnetic field, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dHdtx | (ewfd2.murinvxx\*ewfd2.dBdtx+ewfd2.murinvxy\*ewfd2.dBdty+ewfd2.murinvxz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, x component | Domains 14, 19 |  |
| ewfd2.dHdty | (ewfd2.murinvyx\*ewfd2.dBdtx+ewfd2.murinvyy\*ewfd2.dBdty+ewfd2.murinvyz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, y component | Domains 14, 19 |  |
| ewfd2.dHdtz | (ewfd2.murinvzx\*ewfd2.dBdtx+ewfd2.murinvzy\*ewfd2.dBdty+ewfd2.murinvzz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, z component | Domains 14, 19 |  |
| ewfd2.dHdtx | (ewfd2.murinvxx\*ewfd2.dBdtx+ewfd2.murinvxy\*ewfd2.dBdty+ewfd2.murinvxz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dHdty | (ewfd2.murinvyx\*ewfd2.dBdtx+ewfd2.murinvyy\*ewfd2.dBdty+ewfd2.murinvyz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dHdtz | (ewfd2.murinvzx\*ewfd2.dBdtx+ewfd2.murinvzy\*ewfd2.dBdty+ewfd2.murinvzz\*ewfd2.dBdtz)/mu0\_const | A/(m·s) | Magnetic field, time derivative, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normE | sqrt(realdot(ewfd2.Ex,ewfd2.Ex)+realdot(ewfd2.Ey,ewfd2.Ey)+realdot(ewfd2.Ez,ewfd2.Ez)) | V/m | Electric field norm | Domains 14, 19 |  |
| ewfd2.normE | sqrt(realdot(ewfd2.Ex,ewfd2.Ex)+realdot(ewfd2.Ey,ewfd2.Ey)+realdot(ewfd2.Ez,ewfd2.Ez)) | V/m | Electric field norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normEi | sqrt(realdot(real(ewfd2.Ex),real(ewfd2.Ex))+realdot(real(ewfd2.Ey),real(ewfd2.Ey))+realdot(real(ewfd2.Ez),real(ewfd2.Ez))) | V/m | Instantaneous electric field norm | Domains 14, 19 |  |
| ewfd2.normEi | sqrt(realdot(real(ewfd2.Ex),real(ewfd2.Ex))+realdot(real(ewfd2.Ey),real(ewfd2.Ey))+realdot(real(ewfd2.Ez),real(ewfd2.Ez))) | V/m | Instantaneous electric field norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Mx | ewfd2.Bx/mu0\_const-ewfd2.Hx | A/m | Magnetization, x component | Domains 14, 19 |  |
| ewfd2.My | ewfd2.By/mu0\_const-ewfd2.Hy | A/m | Magnetization, y component | Domains 14, 19 |  |
| ewfd2.Mz | ewfd2.Bz/mu0\_const-ewfd2.Hz | A/m | Magnetization, z component | Domains 14, 19 |  |
| ewfd2.Mx | ewfd2.Bx/mu0\_const-ewfd2.Hx | A/m | Magnetization, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.My | ewfd2.By/mu0\_const-ewfd2.Hy | A/m | Magnetization, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Mz | ewfd2.Bz/mu0\_const-ewfd2.Hz | A/m | Magnetization, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normM | sqrt(realdot(ewfd2.Mx,ewfd2.Mx)+realdot(ewfd2.My,ewfd2.My)+realdot(ewfd2.Mz,ewfd2.Mz)) | A/m | Magnetization norm | Domains 14, 19 |  |
| ewfd2.normM | sqrt(realdot(ewfd2.Mx,ewfd2.Mx)+realdot(ewfd2.My,ewfd2.My)+realdot(ewfd2.Mz,ewfd2.Mz)) | A/m | Magnetization norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Brx | 0 | T | Remanent flux density, x component | Domains 14, 19 |  |
| ewfd2.Bry | 0 | T | Remanent flux density, y component | Domains 14, 19 |  |
| ewfd2.Brz | 0 | T | Remanent flux density, z component | Domains 14, 19 |  |
| ewfd2.Brx | 0 | T | Remanent flux density, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Bry | 0 | T | Remanent flux density, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Brz | 0 | T | Remanent flux density, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normBr | sqrt(realdot(ewfd2.Brx,ewfd2.Brx)+realdot(ewfd2.Bry,ewfd2.Bry)+realdot(ewfd2.Brz,ewfd2.Brz)) | T | Remanent flux density norm | Domains 14, 19 |  |
| ewfd2.normBr | sqrt(realdot(ewfd2.Brx,ewfd2.Brx)+realdot(ewfd2.Bry,ewfd2.Bry)+realdot(ewfd2.Brz,ewfd2.Brz)) | T | Remanent flux density norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Qml | real(0.5\*ewfd2.iomega\*(ewfd2.Bx\*conj(ewfd2.Hx)+ewfd2.By\*conj(ewfd2.Hy)+ewfd2.Bz\*conj(ewfd2.Hz))) | W/m³ | Magnetic losses | Domains 14, 19 |  |
| ewfd2.Qml | real(0.5\*ewfd2.iomega\*(ewfd2.Bx\*conj(ewfd2.Hx)+ewfd2.By\*conj(ewfd2.Hy)+ewfd2.Bz\*conj(ewfd2.Hz))) | W/m³ | Magnetic losses | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.tBx | ewfd2.Bx-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.nx | T | Tangential magnetic flux density, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tBy | ewfd2.By-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.ny | T | Tangential magnetic flux density, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tBz | ewfd2.Bz-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.nz | T | Tangential magnetic flux density, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.tBx | ewfd2.Bx-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.nx | T | Tangential magnetic flux density, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tBy | ewfd2.By-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.ny | T | Tangential magnetic flux density, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.tBz | ewfd2.Bz-(ewfd2.nx\*ewfd2.Bx+ewfd2.ny\*ewfd2.By+ewfd2.nz\*ewfd2.Bz)\*ewfd2.nz | T | Tangential magnetic flux density, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.normB | sqrt(realdot(ewfd2.Bx,ewfd2.Bx)+realdot(ewfd2.By,ewfd2.By)+realdot(ewfd2.Bz,ewfd2.Bz)) | T | Magnetic flux density norm | Domains 14, 19 |  |
| ewfd2.normB | sqrt(realdot(ewfd2.Bx,ewfd2.Bx)+realdot(ewfd2.By,ewfd2.By)+realdot(ewfd2.Bz,ewfd2.Bz)) | T | Magnetic flux density norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normH | sqrt(realdot(ewfd2.Hx,ewfd2.Hx)+realdot(ewfd2.Hy,ewfd2.Hy)+realdot(ewfd2.Hz,ewfd2.Hz)) | A/m | Magnetic field norm | Domains 14, 19 |  |
| ewfd2.normH | sqrt(realdot(ewfd2.Hx,ewfd2.Hx)+realdot(ewfd2.Hy,ewfd2.Hy)+realdot(ewfd2.Hz,ewfd2.Hz)) | A/m | Magnetic field norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Jix | ewfd2.sigmaxx\*ewfd2.Ex+ewfd2.sigmaxy\*ewfd2.Ey+ewfd2.sigmaxz\*ewfd2.Ez | A/m² | Induced current density, x component | Domains 14, 19 | + operation |
| ewfd2.Jiy | ewfd2.sigmayx\*ewfd2.Ex+ewfd2.sigmayy\*ewfd2.Ey+ewfd2.sigmayz\*ewfd2.Ez | A/m² | Induced current density, y component | Domains 14, 19 | + operation |
| ewfd2.Jiz | ewfd2.sigmazx\*ewfd2.Ex+ewfd2.sigmazy\*ewfd2.Ey+ewfd2.sigmazz\*ewfd2.Ez | A/m² | Induced current density, z component | Domains 14, 19 | + operation |
| ewfd2.Jix | ewfd2.sigmaxx\*ewfd2.Ex+ewfd2.sigmaxy\*ewfd2.Ey+ewfd2.sigmaxz\*ewfd2.Ez | A/m² | Induced current density, x component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jiy | ewfd2.sigmayx\*ewfd2.Ex+ewfd2.sigmayy\*ewfd2.Ey+ewfd2.sigmayz\*ewfd2.Ez | A/m² | Induced current density, y component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jiz | ewfd2.sigmazx\*ewfd2.Ex+ewfd2.sigmazy\*ewfd2.Ey+ewfd2.sigmazz\*ewfd2.Ez | A/m² | Induced current density, z component | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Jdx | ewfd2.iomega\*ewfd2.Dx | A/m² | Displacement current density, x component | Domains 14, 19 |  |
| ewfd2.Jdy | ewfd2.iomega\*ewfd2.Dy | A/m² | Displacement current density, y component | Domains 14, 19 |  |
| ewfd2.Jdz | ewfd2.iomega\*ewfd2.Dz | A/m² | Displacement current density, z component | Domains 14, 19 |  |
| ewfd2.Jdx | ewfd2.iomega\*ewfd2.Dx | A/m² | Displacement current density, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Jdy | ewfd2.iomega\*ewfd2.Dy | A/m² | Displacement current density, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Jdz | ewfd2.iomega\*ewfd2.Dz | A/m² | Displacement current density, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.normJ | sqrt(realdot(ewfd2.Jx,ewfd2.Jx)+realdot(ewfd2.Jy,ewfd2.Jy)+realdot(ewfd2.Jz,ewfd2.Jz)) | A/m² | Current density norm | Domains 14, 19 |  |
| ewfd2.normJ | sqrt(realdot(ewfd2.Jx,ewfd2.Jx)+realdot(ewfd2.Jy,ewfd2.Jy)+realdot(ewfd2.Jz,ewfd2.Jz)) | A/m² | Current density norm | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.dWe | ewfd2.Weav | J/m³ | Integrand for total electric energy | Domains 14, 19 | Meta |
| ewfd2.dWe | ewfd2.Weav\*pml1.detInvT | J/m³ | Integrand for total electric energy | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.Weav | 0.25\*(realdot(d(ewfd2.freq\*ewfd2.Dx,ewfd2.freq),ewfd2.Ex)+realdot(d(ewfd2.freq\*ewfd2.Dy,ewfd2.freq),ewfd2.Ey)+realdot(d(ewfd2.freq\*ewfd2.Dz,ewfd2.freq),ewfd2.Ez)) | J/m³ | Electric energy density time average | Domains 14, 19 | + operation |
| ewfd2.Weav | 0.25\*(realdot(d(ewfd2.freq\*ewfd2.Dx,ewfd2.freq),ewfd2.Ex)+realdot(d(ewfd2.freq\*ewfd2.Dy,ewfd2.freq),ewfd2.Ey)+realdot(d(ewfd2.freq\*ewfd2.Dz,ewfd2.freq),ewfd2.Ez)) | J/m³ | Electric energy density time average | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.Qrh | 0.5\*(realdot(ewfd2.Jx,ewfd2.Ex)+realdot(ewfd2.Jy,ewfd2.Ey)+realdot(ewfd2.Jz,ewfd2.Ez)) | W/m³ | Resistive losses | Domains 14, 19 | + operation |
| ewfd2.Qrh | 0.5\*(realdot(ewfd2.Jx,ewfd2.Ex)+realdot(ewfd2.Jy,ewfd2.Ey)+realdot(ewfd2.Jz,ewfd2.Ez)) | W/m³ | Resistive losses | Domains 1–13, 15–18, 20–28 | + operation |
| ewfd2.dWm | ewfd2.Wmav | J/m³ | Integrand for total magnetic energy | Domains 14, 19 | Meta |
| ewfd2.dWm | ewfd2.Wmav\*pml1.detInvT | J/m³ | Integrand for total magnetic energy | Domains 1–13, 15–18, 20–28 | Meta |
| ewfd2.Wmav | 0.25\*(realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.murxx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.murxy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.murxz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hx)+realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.muryx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.muryy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.muryz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hy)+realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.murzx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.murzy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.murzz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hz)) | J/m³ | Magnetic energy density time average | Domains 14, 19 |  |
| ewfd2.Wmav | 0.25\*(realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.murxx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.murxy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.murxz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hx)+realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.muryx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.muryy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.muryz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hy)+realdot(mu0\_const\*(d(ewfd2.freq\*ewfd2.murzx,ewfd2.freq)\*ewfd2.Hx+d(ewfd2.freq\*ewfd2.murzy,ewfd2.freq)\*ewfd2.Hy+d(ewfd2.freq\*ewfd2.murzz,ewfd2.freq)\*ewfd2.Hz),ewfd2.Hz)) | J/m³ | Magnetic energy density time average | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Poavx | 0.5\*real(conj(ewfd2.Hz)\*ewfd2.Ey-conj(ewfd2.Hy)\*ewfd2.Ez) | W/m² | Power flow, time average, x component | Domains 14, 19 |  |
| ewfd2.Poavy | 0.5\*real(-conj(ewfd2.Hz)\*ewfd2.Ex+conj(ewfd2.Hx)\*ewfd2.Ez) | W/m² | Power flow, time average, y component | Domains 14, 19 |  |
| ewfd2.Poavz | 0.5\*real(conj(ewfd2.Hy)\*ewfd2.Ex-conj(ewfd2.Hx)\*ewfd2.Ey) | W/m² | Power flow, time average, z component | Domains 14, 19 |  |
| ewfd2.Poavx | 0.5\*real(conj(ewfd2.Hz)\*ewfd2.Ey-conj(ewfd2.Hy)\*ewfd2.Ez) | W/m² | Power flow, time average, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Poavy | 0.5\*real(-conj(ewfd2.Hz)\*ewfd2.Ex+conj(ewfd2.Hx)\*ewfd2.Ez) | W/m² | Power flow, time average, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.Poavz | 0.5\*real(conj(ewfd2.Hy)\*ewfd2.Ex-conj(ewfd2.Hx)\*ewfd2.Ey) | W/m² | Power flow, time average, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.nPoav | down(ewfd2.Poavx)\*ewfd2.nPMLx+down(ewfd2.Poavy)\*ewfd2.nPMLy+down(ewfd2.Poavz)\*ewfd2.nPMLz | W/m² | Power outflow, time average | Boundaries 47–49 |  |
| ewfd2.nPoav | up(ewfd2.Poavx)\*ewfd2.nPMLx+up(ewfd2.Poavy)\*ewfd2.nPMLy+up(ewfd2.Poavz)\*ewfd2.nPMLz | W/m² | Power outflow, time average | Boundaries 52, 58, 86 |  |
| ewfd2.nPoav | ewfd2.Poavx\*ewfd2.nPMLx+ewfd2.Poavy\*ewfd2.nPMLy+ewfd2.Poavz\*ewfd2.nPMLz | W/m² | Power outflow, time average | Boundaries 67–72 |  |
| ewfd2.relPoavx | 0.5\*real(conj(ewfd2.relHz)\*ewfd2.relEy-conj(ewfd2.relHy)\*ewfd2.relEz) | W/m² | Power flow of the relative fields, time average, x component | Domains 14, 19 |  |
| ewfd2.relPoavy | 0.5\*real(-conj(ewfd2.relHz)\*ewfd2.relEx+conj(ewfd2.relHx)\*ewfd2.relEz) | W/m² | Power flow of the relative fields, time average, y component | Domains 14, 19 |  |
| ewfd2.relPoavz | 0.5\*real(conj(ewfd2.relHy)\*ewfd2.relEx-conj(ewfd2.relHx)\*ewfd2.relEy) | W/m² | Power flow of the relative fields, time average, z component | Domains 14, 19 |  |
| ewfd2.relPoavx | 0.5\*real(conj(ewfd2.relHz)\*ewfd2.relEy-conj(ewfd2.relHy)\*ewfd2.relEz) | W/m² | Power flow of the relative fields, time average, x component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relPoavy | 0.5\*real(-conj(ewfd2.relHz)\*ewfd2.relEx+conj(ewfd2.relHx)\*ewfd2.relEz) | W/m² | Power flow of the relative fields, time average, y component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.relPoavz | 0.5\*real(conj(ewfd2.relHy)\*ewfd2.relEx-conj(ewfd2.relHx)\*ewfd2.relEy) | W/m² | Power flow of the relative fields, time average, z component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.nrelPoav | ewfd2.relPoavx\*ewfd2.nPMLx+ewfd2.relPoavy\*ewfd2.nPMLy+ewfd2.relPoavz\*ewfd2.nPMLz | W/m² | Power outflow of the relative fields, time average | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.nrelPoav | ewfd2.relPoavx\*ewfd2.nPMLx+ewfd2.relPoavy\*ewfd2.nPMLy+ewfd2.relPoavz\*ewfd2.nPMLz | W/m² | Power outflow of the relative fields, time average | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.deltaS | 1/real(sqrt(ewfd2.iomega\*mu0\_const\*(ewfd2.murxx+ewfd2.muryy+ewfd2.murzz)\*(ewfd2.sigmaxx+ewfd2.sigmayy+ewfd2.sigmazz+ewfd2.iomega\*epsilon0\_const\*(ewfd2.epsilonrxx+ewfd2.epsilonryy+ewfd2.epsilonrzz))/9)) | m | Skin depth | Domains 14, 19 |  |
| ewfd2.deltaS | 1/real(sqrt(ewfd2.iomega\*mu0\_const\*(ewfd2.murxx+ewfd2.muryy+ewfd2.murzz)\*(ewfd2.sigmaxx+ewfd2.sigmayy+ewfd2.sigmazz+ewfd2.iomega\*epsilon0\_const\*(ewfd2.epsilonrxx+ewfd2.epsilonryy+ewfd2.epsilonrzz))/9)) | m | Skin depth | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.unTx | ewfd2.unTmx+ewfd2.unTex | Pa | Maxwell upward surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.unTy | ewfd2.unTmy+ewfd2.unTey | Pa | Maxwell upward surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.unTz | ewfd2.unTmz+ewfd2.unTez | Pa | Maxwell upward surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.unTx | ewfd2.unTmx+ewfd2.unTex | Pa | Maxwell upward surface stress tensor, x component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.unTy | ewfd2.unTmy+ewfd2.unTey | Pa | Maxwell upward surface stress tensor, y component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.unTz | ewfd2.unTmz+ewfd2.unTez | Pa | Maxwell upward surface stress tensor, z component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.unTx | 0 | Pa | Maxwell upward surface stress tensor, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.unTy | 0 | Pa | Maxwell upward surface stress tensor, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.unTz | 0 | Pa | Maxwell upward surface stress tensor, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.dnTx | ewfd2.dnTmx+ewfd2.dnTex | Pa | Maxwell downward surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.dnTy | ewfd2.dnTmy+ewfd2.dnTey | Pa | Maxwell downward surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.dnTz | ewfd2.dnTmz+ewfd2.dnTez | Pa | Maxwell downward surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 | + operation |
| ewfd2.dnTx | ewfd2.dnTmx+ewfd2.dnTex | Pa | Maxwell downward surface stress tensor, x component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.dnTy | ewfd2.dnTmy+ewfd2.dnTey | Pa | Maxwell downward surface stress tensor, y component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.dnTz | ewfd2.dnTmz+ewfd2.dnTez | Pa | Maxwell downward surface stress tensor, z component | Boundaries 6, 9, 12, 15–16, 18–19, 22, 25–26, 28–29, 34, 37, 39–40, 42, 44–45, 50–51, 54–55, 57, 59–62, 73, 76, 78–79, 81, 83–84, 87–91, 93–94, 96–101 | + operation |
| ewfd2.dnTx | ewfd2.dnTmx+ewfd2.dnTex | Pa | Maxwell downward surface stress tensor, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.dnTy | ewfd2.dnTmy+ewfd2.dnTey | Pa | Maxwell downward surface stress tensor, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.dnTz | ewfd2.dnTmz+ewfd2.dnTez | Pa | Maxwell downward surface stress tensor, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.unx | unx |  | Normal vector up direction, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.uny | uny |  | Normal vector up direction, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unz | unz |  | Normal vector up direction, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unx | unx |  | Normal vector up direction, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.uny | uny |  | Normal vector up direction, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unz | unz |  | Normal vector up direction, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnx | dnx |  | Normal vector down direction, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dny | dny |  | Normal vector down direction, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnz | dnz |  | Normal vector down direction, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnx | dnx |  | Normal vector down direction, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dny | dny |  | Normal vector down direction, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnz | dnz |  | Normal vector down direction, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTmx | 0.5\*real(-0.5\*ewfd2.dnx\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.Bx)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTmy | 0.5\*real(-0.5\*ewfd2.dny\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.By)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTmz | 0.5\*real(-0.5\*ewfd2.dnz\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.Bz)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTmx | 0.5\*real(-0.5\*ewfd2.dnx\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.Bx)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTmy | 0.5\*real(-0.5\*ewfd2.dny\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.By)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTmz | 0.5\*real(-0.5\*ewfd2.dnz\*(up(ewfd2.Bx)\*up(conj(ewfd2.Hx))+up(ewfd2.By)\*up(conj(ewfd2.Hy))+up(ewfd2.Bz)\*up(conj(ewfd2.Hz)))+up(ewfd2.Bz)\*(up(conj(ewfd2.Hx))\*ewfd2.dnx+up(conj(ewfd2.Hy))\*ewfd2.dny+up(conj(ewfd2.Hz))\*ewfd2.dnz)) | Pa | Maxwell upward magnetic surface stress tensor, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTmx | 0.5\*real(-0.5\*ewfd2.unx\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.Bx)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTmy | 0.5\*real(-0.5\*ewfd2.uny\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.By)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTmz | 0.5\*real(-0.5\*ewfd2.unz\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.Bz)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTmx | 0.5\*real(-0.5\*ewfd2.unx\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.Bx)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTmy | 0.5\*real(-0.5\*ewfd2.uny\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.By)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTmz | 0.5\*real(-0.5\*ewfd2.unz\*(down(ewfd2.Bx)\*down(conj(ewfd2.Hx))+down(ewfd2.By)\*down(conj(ewfd2.Hy))+down(ewfd2.Bz)\*down(conj(ewfd2.Hz)))+down(ewfd2.Bz)\*(down(conj(ewfd2.Hx))\*ewfd2.unx+down(conj(ewfd2.Hy))\*ewfd2.uny+down(conj(ewfd2.Hz))\*ewfd2.unz)) | Pa | Maxwell downward magnetic surface stress tensor, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTex | 0.5\*real(-0.5\*ewfd2.dnx\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dx)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTey | 0.5\*real(-0.5\*ewfd2.dny\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dy)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTez | 0.5\*real(-0.5\*ewfd2.dnz\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dz)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.unTex | 0.5\*real(-0.5\*ewfd2.dnx\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dx)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTey | 0.5\*real(-0.5\*ewfd2.dny\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dy)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.unTez | 0.5\*real(-0.5\*ewfd2.dnz\*(up(ewfd2.Dx)\*up(conj(ewfd2.Ex))+up(ewfd2.Dy)\*up(conj(ewfd2.Ey))+up(ewfd2.Dz)\*up(conj(ewfd2.Ez)))+up(ewfd2.Dz)\*(up(conj(ewfd2.Ex))\*ewfd2.dnx+up(conj(ewfd2.Ey))\*ewfd2.dny+up(conj(ewfd2.Ez))\*ewfd2.dnz)) | Pa | Maxwell upward electric surface stress tensor, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTex | 0.5\*real(-0.5\*ewfd2.unx\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dx)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, x component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTey | 0.5\*real(-0.5\*ewfd2.uny\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dy)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, y component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTez | 0.5\*real(-0.5\*ewfd2.unz\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dz)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, z component | Boundaries 47–49, 52, 58, 67–72, 86 |  |
| ewfd2.dnTex | 0.5\*real(-0.5\*ewfd2.unx\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dx)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, x component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTey | 0.5\*real(-0.5\*ewfd2.uny\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dy)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, y component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.dnTez | 0.5\*real(-0.5\*ewfd2.unz\*(down(ewfd2.Dx)\*down(conj(ewfd2.Ex))+down(ewfd2.Dy)\*down(conj(ewfd2.Ey))+down(ewfd2.Dz)\*down(conj(ewfd2.Ez)))+down(ewfd2.Dz)\*(down(conj(ewfd2.Ex))\*ewfd2.unx+down(conj(ewfd2.Ey))\*ewfd2.uny+down(conj(ewfd2.Ez))\*ewfd2.unz)) | Pa | Maxwell downward electric surface stress tensor, z component | Boundaries 1–46, 50–51, 53–57, 59–66, 73–85, 87–114 |  |
| ewfd2.epsilonr0xx | ewfd2.epsilonrmxx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xx component | Domains 14, 19 |  |
| ewfd2.epsilonr0yx | ewfd2.epsilonrmyx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yx component | Domains 14, 19 |  |
| ewfd2.epsilonr0zx | ewfd2.epsilonrmzx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zx component | Domains 14, 19 |  |
| ewfd2.epsilonr0xy | ewfd2.epsilonrmxy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xy component | Domains 14, 19 |  |
| ewfd2.epsilonr0yy | ewfd2.epsilonrmyy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yy component | Domains 14, 19 |  |
| ewfd2.epsilonr0zy | ewfd2.epsilonrmzy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zy component | Domains 14, 19 |  |
| ewfd2.epsilonr0xz | ewfd2.epsilonrmxz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xz component | Domains 14, 19 |  |
| ewfd2.epsilonr0yz | ewfd2.epsilonrmyz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yz component | Domains 14, 19 |  |
| ewfd2.epsilonr0zz | ewfd2.epsilonrmzz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zz component | Domains 14, 19 |  |
| ewfd2.epsilonr0xx | ewfd2.epsilonrmxx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0yx | ewfd2.epsilonrmyx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0zx | ewfd2.epsilonrmzx | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zx component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0xy | ewfd2.epsilonrmxy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0yy | ewfd2.epsilonrmyy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0zy | ewfd2.epsilonrmzy | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zy component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0xz | ewfd2.epsilonrmxz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), xz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0yz | ewfd2.epsilonrmyz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), yz component | Domains 1–13, 15–18, 20–28 |  |
| ewfd2.epsilonr0zz | ewfd2.epsilonrmzz | 1 | Relative permittivity (for semiconductor-electromagnetic waves coupling), zz component | Domains 1–13, 15–18, 20–28 |  |

#### Shape functions

| **Name** | **Shape function** | **Unit** | **Description** | **Shape frame** | **Selection** |
| --- | --- | --- | --- | --- | --- |
| Ex | Curl (Quadratic) | V/m | Electric field, x component | Material | Domains 14, 19 |
| Ey | Curl (Quadratic) | V/m | Electric field, y component | Material | Domains 14, 19 |
| Ez | Curl (Quadratic) | V/m | Electric field, z component | Material | Domains 14, 19 |
| Ex | Curl (Quadratic) | V/m | Electric field, x component | Material | Domains 1–13, 15–18, 20–28 |
| Ey | Curl (Quadratic) | V/m | Electric field, y component | Material | Domains 1–13, 15–18, 20–28 |
| Ez | Curl (Quadratic) | V/m | Electric field, z component | Material | Domains 1–13, 15–18, 20–28 |

* + 1. Perfect Electric Conductor 1



Perfect Electric Conductor 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: All boundaries |

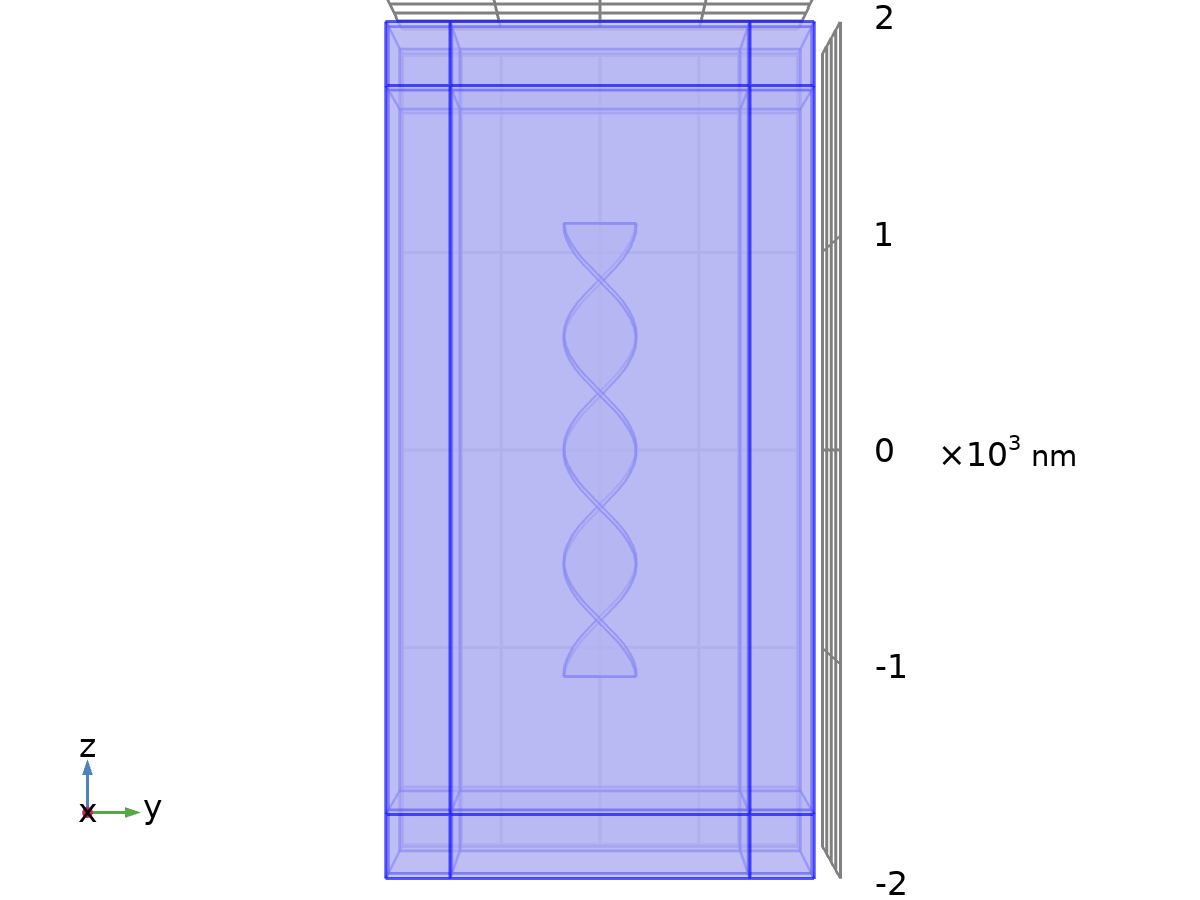
Equations



#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd2.Jsx | -down(ewfd2.Hz)\*ewfd2.dny+down(ewfd2.Hy)\*ewfd2.dnz | A/m | Surface current density, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.Jsy | down(ewfd2.Hz)\*ewfd2.dnx-down(ewfd2.Hx)\*ewfd2.dnz | A/m | Surface current density, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.Jsz | -down(ewfd2.Hy)\*ewfd2.dnx+down(ewfd2.Hx)\*ewfd2.dny | A/m | Surface current density, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 | + operation |
| ewfd2.testtEx | test(ewfd2.tEx) | V/m | Tangential electric field, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.testtEy | test(ewfd2.tEy) | V/m | Tangential electric field, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.testtEz | test(ewfd2.tEz) | V/m | Tangential electric field, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.E0x | -ewfd2.Ebx | V/m | Electric field, x component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.E0y | -ewfd2.Eby | V/m | Electric field, y component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |
| ewfd2.E0z | -ewfd2.Ebz | V/m | Electric field, z component | Boundaries 1–5, 7–8, 10–11, 13–14, 17, 20–21, 23–24, 27, 30–33, 35–36, 38, 41, 43, 46, 53, 56, 63–66, 74–75, 77, 80, 82, 85, 92, 95, 102–114 |  |

* + 1. Initial Values 1



Initial Values 1

Selection

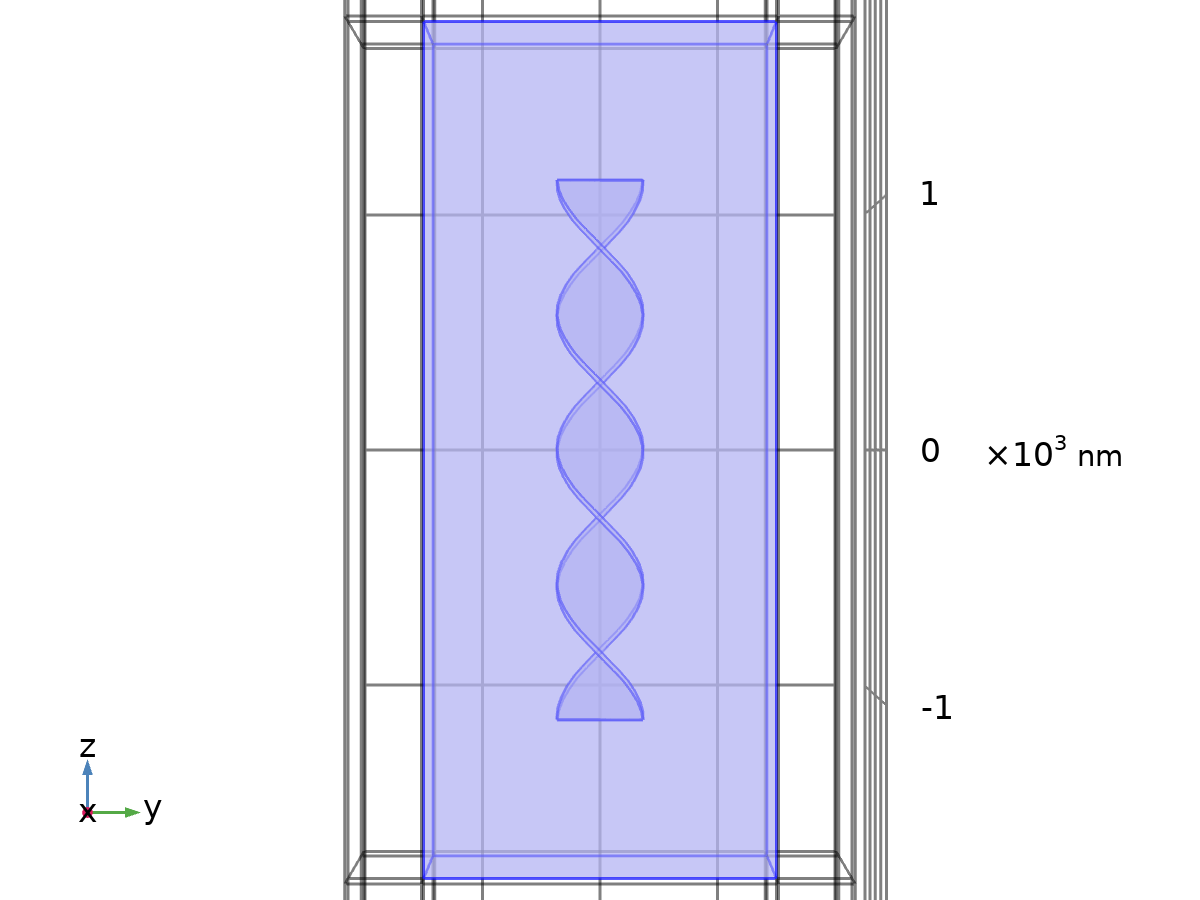
|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: All domains |

#### Coordinate System Selection

Settings

| **Description** | **Value** |
| --- | --- |
| Coordinate system | Global coordinate system |

* + 1. Far-Field Domain 1



Far-Field Domain 1

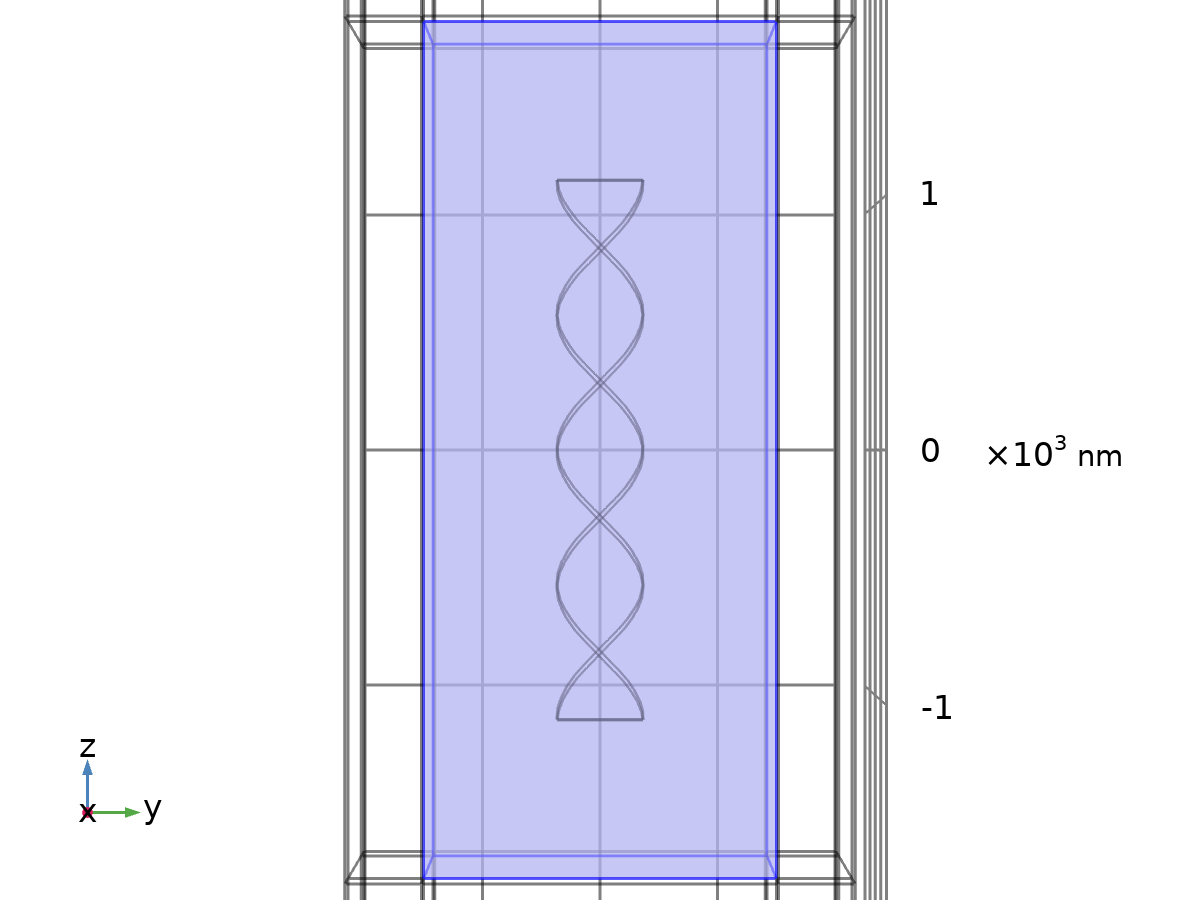
Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domain 14 |

#### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** |
| --- | --- | --- | --- | --- |
| ewfd2.Fark\_ffd1 | ewfd2.ffd1\_ave(ewfd2.iomega\*sqrt(mu0\_const\*epsilon0\_const)\*sqrt((ewfd2.murxx\*(ewfd2.epsilonrxx-ewfd2.sigmaxx\*i\*j/ewfd2.iomega)+ewfd2.murxy\*(ewfd2.epsilonryx-ewfd2.sigmayx\*i\*j/ewfd2.iomega)+ewfd2.murxz\*(ewfd2.epsilonrzx-ewfd2.sigmazx\*i\*j/ewfd2.iomega)+ewfd2.muryx\*(ewfd2.epsilonrxy-ewfd2.sigmaxy\*i\*j/ewfd2.iomega)+ewfd2.muryy\*(ewfd2.epsilonryy-ewfd2.sigmayy\*i\*j/ewfd2.iomega)+ewfd2.muryz\*(ewfd2.epsilonrzy-ewfd2.sigmazy\*i\*j/ewfd2.iomega)+ewfd2.murzx\*(ewfd2.epsilonrxz-ewfd2.sigmaxz\*i\*j/ewfd2.iomega)+ewfd2.murzy\*(ewfd2.epsilonryz-ewfd2.sigmayz\*i\*j/ewfd2.iomega)+ewfd2.murzz\*(ewfd2.epsilonrzz-ewfd2.sigmazz\*i\*j/ewfd2.iomega))/3)/i) | rad/m | Far-field wave number | Global |
| ewfd2.Farmur\_ffd1 | ewfd2.ffd1\_ave((ewfd2.murxx+ewfd2.muryy+ewfd2.murzz)/3) | H/m | Far-field permeability | Global |

#### Far-Field Calculation 1



Far-Field Calculation 1

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundaries 47–49, 52, 58, 86 |

##### Far-Field Calculation

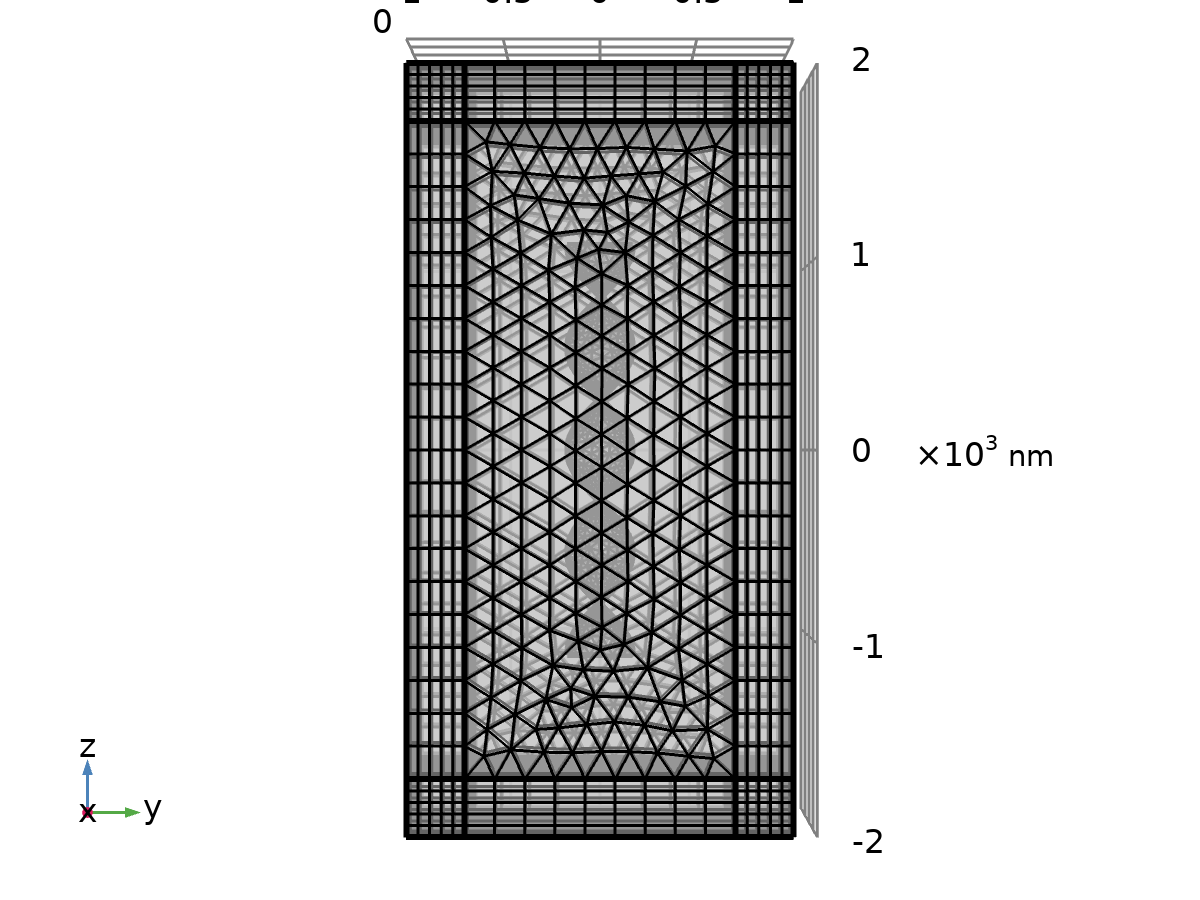
Settings

| **Description** | **Value** |
| --- | --- |
| Far-field variable name | Efar |
| Symmetry in the x=0 plane | Off |
| Symmetry in the y=0 plane | Off |
| Symmetry in the z=0 plane | Off |
| Boundary relative to domain | Inside |

##### Variables

| **Name** | **Expression** | **Unit** | **Description** | **Selection** | **Details** |
| --- | --- | --- | --- | --- | --- |
| ewfd2.nXEx | Ez\*ny-Ey\*nz | V/m | Tangential electric field, x component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.nXEy | -Ez\*nx+Ex\*nz | V/m | Tangential electric field, y component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.nXEz | Ey\*nx-Ex\*ny | V/m | Tangential electric field, z component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.nXCurlEx | (d(Ey,x)-d(Ex,y))\*ny+(d(Ez,x)-d(Ex,z))\*nz | V/m² | Tangential curl of E, x component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.nXCurlEy | (-d(Ey,x)+d(Ex,y))\*nx+(d(Ez,y)-d(Ey,z))\*nz | V/m² | Tangential curl of E, y component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.nXCurlEz | (-d(Ez,x)+d(Ex,z))\*nx+(-d(Ez,y)+d(Ey,z))\*ny | V/m² | Tangential curl of E, z component | Boundaries 47–49, 52, 58, 86 | Meta |
| ewfd2.Efarx | Efarx(x,y,z) | V/m | Far-field variable, x component | Global |  |
| ewfd2.Efary | Efary(x,y,z) | V/m | Far-field variable, y component | Global |  |
| ewfd2.Efarz | Efarz(x,y,z) | V/m | Far-field variable, z component | Global |  |
| ewfd2.normEfar | sqrt(abs(Efarx(x,y,z))^2+abs(Efary(x,y,z))^2+abs(Efarz(x,y,z))^2) | V/m | Far-field norm | Global |  |
| ewfd2.normdBEfar | 20\*log10(sqrt(abs(Efarx(x,y,z))^2+abs(Efary(x,y,z))^2+abs(Efarz(x,y,z))^2)) | dB | Far-field norm, dB | Global |  |
| ewfd2.axialRatio | (abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))-(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)+abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))+(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j))/(abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))-(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)-abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))+(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)) | 1 | Axial ratio | Global |  |
| ewfd2.axialRatiodB | 20\*log10(abs((abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))-(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)+abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))+(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j))/(abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))-(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)-abs(Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z)))+(-Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)))\*j)))) | 1 | Axial ratio, dB | Global |  |
| ewfd2.Efartheta | Efarx(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*cos(atan2(y,x))+Efary(x,y,z)\*cos(abs(atan2(sqrt(x^2+y^2),z)))\*sin(atan2(y,x))-Efarz(x,y,z)\*sin(abs(atan2(sqrt(x^2+y^2),z))) | V/m | Far-field variable, theta component | Global |  |
| ewfd2.Efarphi | -Efarx(x,y,z)\*sin(atan2(y,x))+Efary(x,y,z)\*cos(atan2(y,x)) | V/m | Far-field variable, phi component | Global |  |
| ewfd2.bRCS3D | 4\*pi\*sqrt(abs(Efarx(x,y,z))^2+abs(Efary(x,y,z))^2+abs(Efarz(x,y,z))^2)^2/abs(sqrt(ewfd.Ex^2+ewfd.Ey^2+ewfd.Ez^2))^2 | m² | Bistatic radar cross section | Global |  |

* 1. Mesh 1



Mesh 1

* + 1. Size (size)

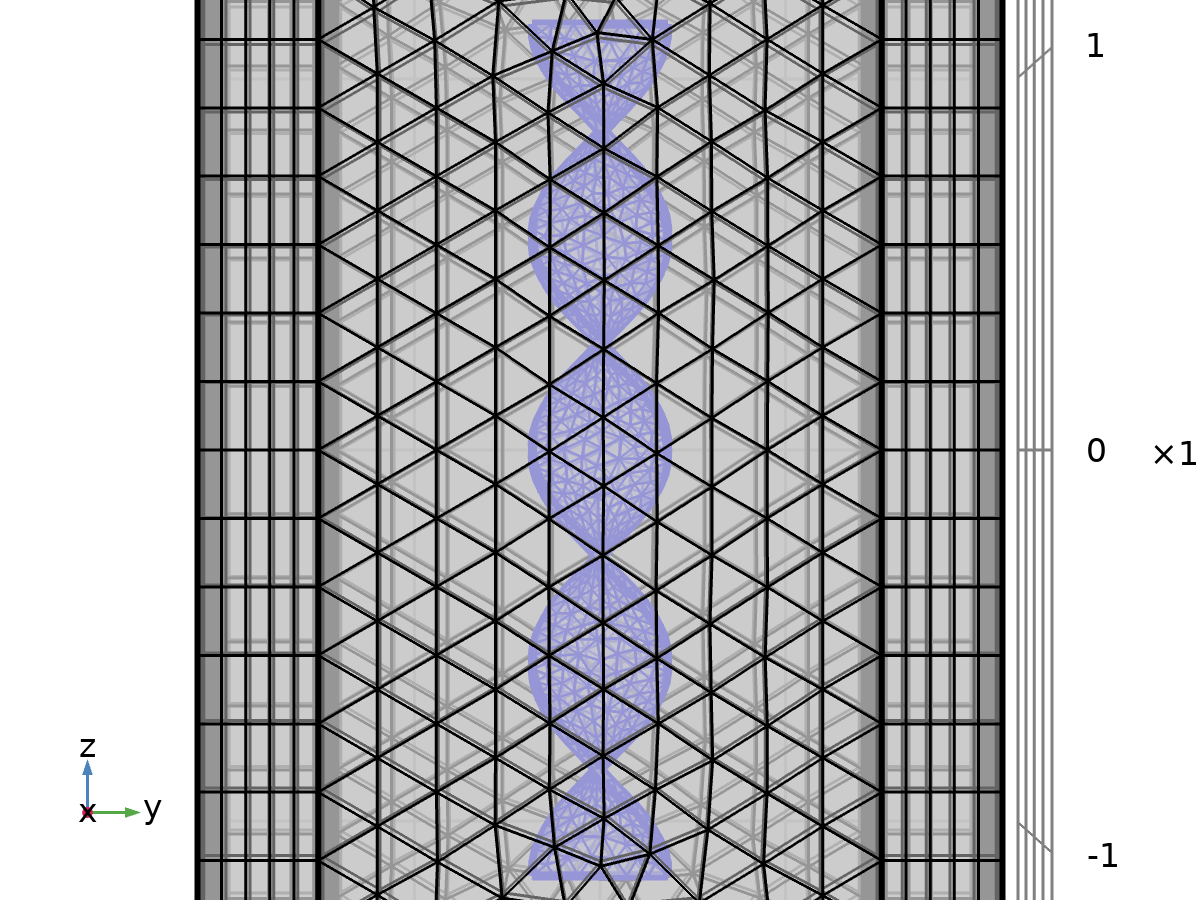
Settings

| **Description** | **Value** |
| --- | --- |
| Maximum element size | 169.20 |
| Minimum element size | 5.0750 |
| Curvature factor | 0.7 |
| Resolution of narrow regions | 0.4 |
| Maximum element growth rate | 1.6 |
| Predefined size | Coarse |
| Custom element size | Custom |

* + 1. Size 1 (size1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domain 19 |



Size 1

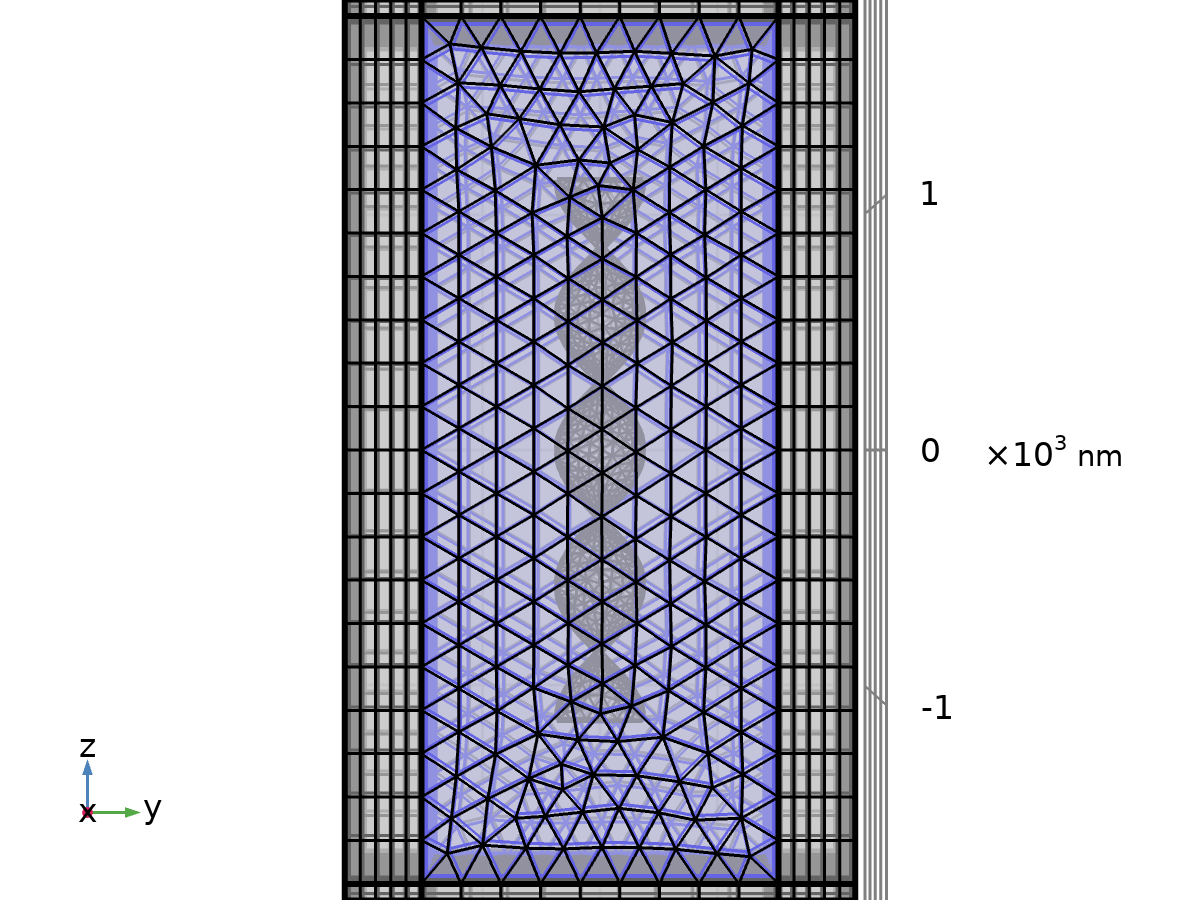
Settings

| **Description** | **Value** |
| --- | --- |
| Maximum element size | 84.080 |
| Minimum element size | 2.5220 |
| Curvature factor | 0.7 |
| Resolution of narrow regions | 0.4 |
| Maximum element growth rate | 1.6 |
| Predefined size | Coarse |
| Custom element size | Custom |

* + 1. Size 2 (size2)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundaries 47–48, 58, 86 |



Size 2

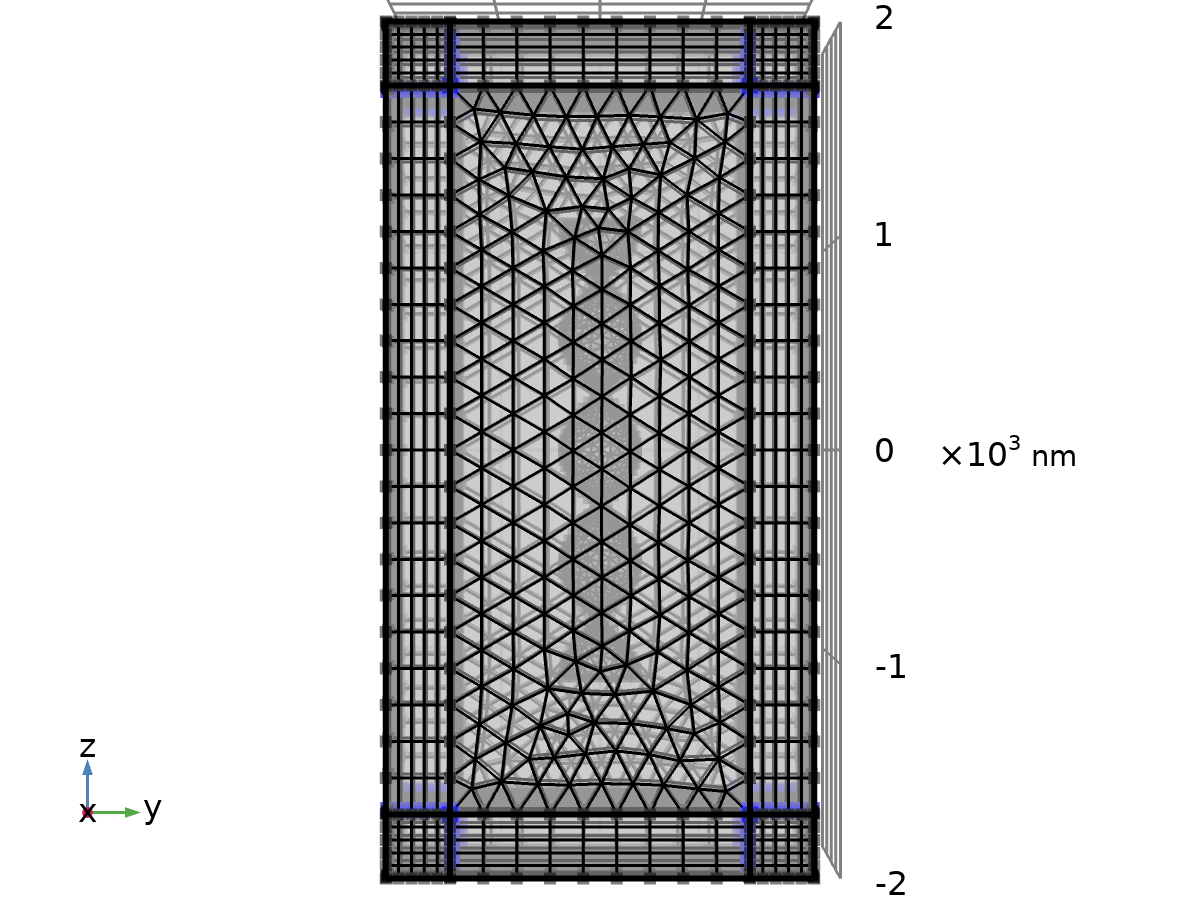
Settings

| **Description** | **Value** |
| --- | --- |
| Maximum element size | 169.20 |
| Minimum element size | 5.0750 |
| Curvature factor | 0.7 |
| Resolution of narrow regions | 0.4 |
| Maximum element growth rate | 1.6 |
| Predefined size | Coarse |
| Custom element size | Custom |

* + 1. Distribution 1 (dis1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Edge |
| Selection | Geometry geom1: Dimension 1: Edges 17, 20, 28, 31, 45, 48, 52, 58, 63, 67, 69–70, 97, 100, 104, 109–110, 112, 115, 119–123 |



Distribution 1

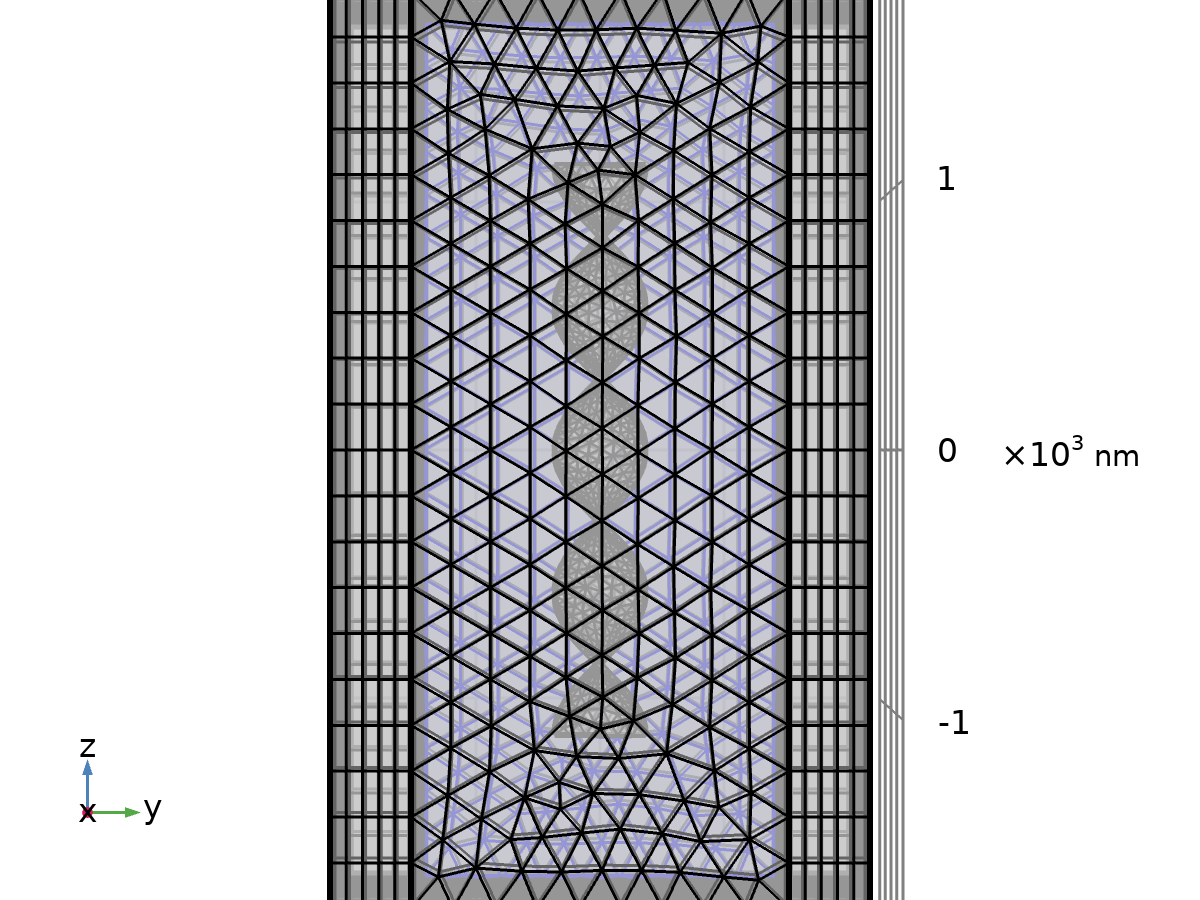
Settings

| **Description** | **Value** |
| --- | --- |
| Distribution type | Predefined |

* + 1. Free Triangular 1 (ftri1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundary 47 |



Free Triangular 1

* + 1. Copy 1 (copy1)

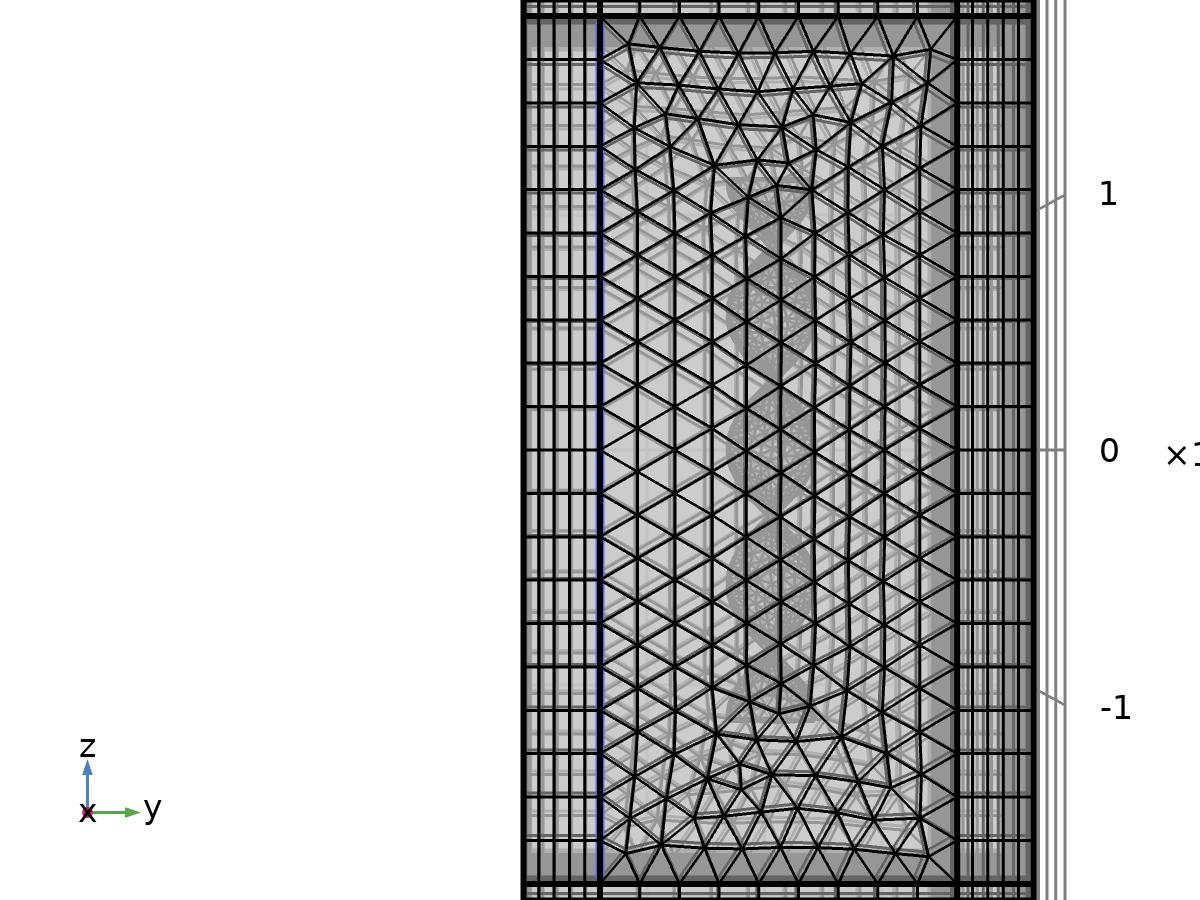
Settings

| **Description** | **Value** |
| --- | --- |
| Mesh | [Mesh 1](#cs4551362) |
| Geometric entity level | Boundary |

* + 1. Free Triangular 2 (ftri2)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Boundary |
| Selection | Geometry geom1: Dimension 2: Boundary 48 |



Free Triangular 2

* + 1. Copy 2 (copy2)

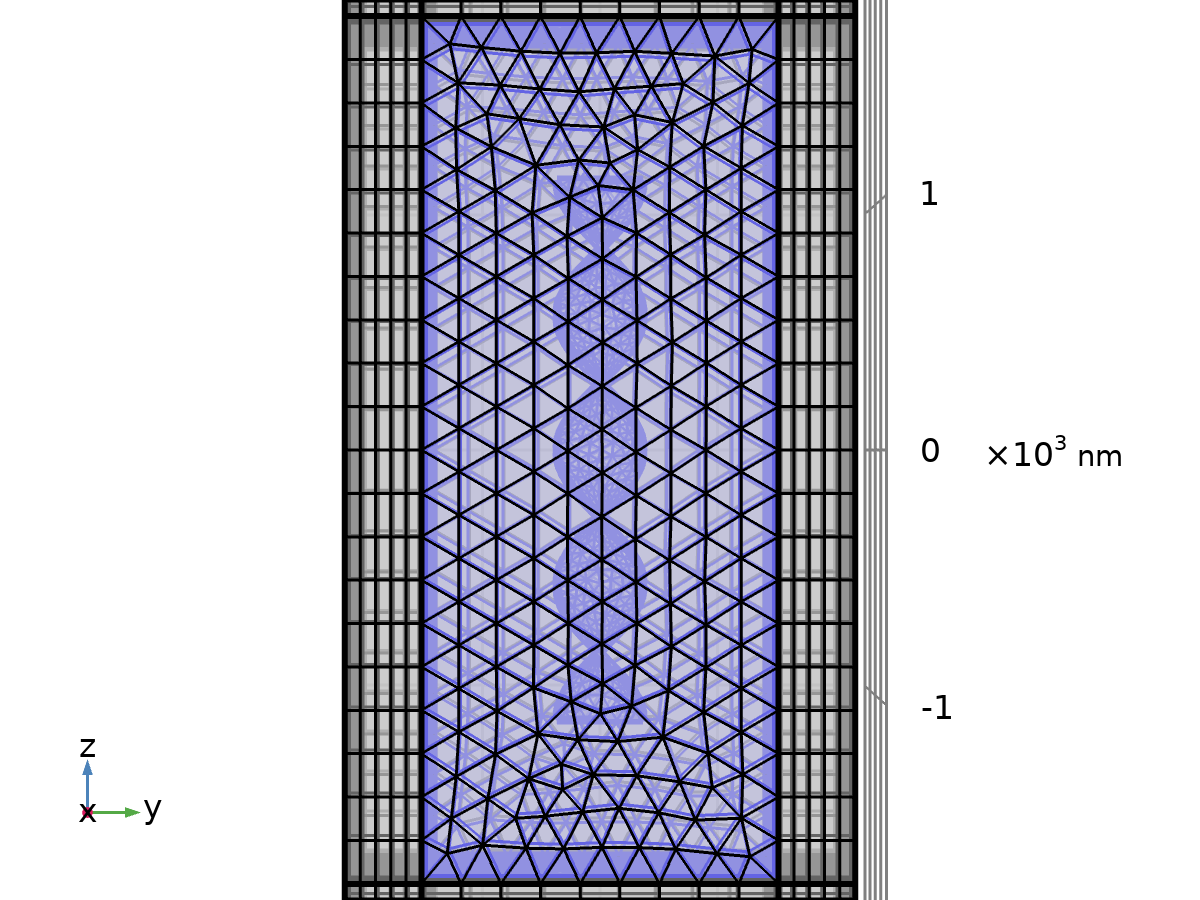
Settings

| **Description** | **Value** |
| --- | --- |
| Mesh | [Mesh 1](#cs4551362) |
| Geometric entity level | Boundary |

* + 1. Free Tetrahedral 1 (ftet1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domains 14, 19 |

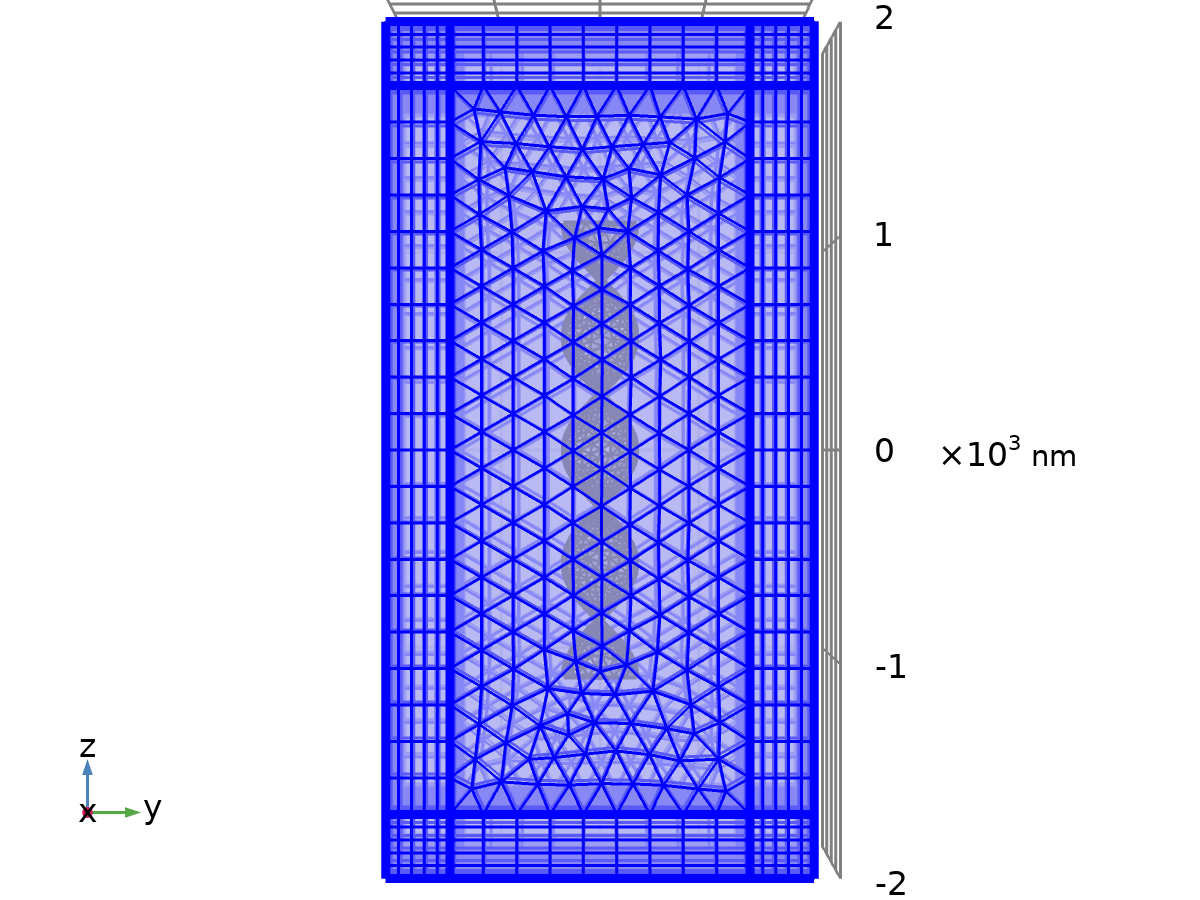


Free Tetrahedral 1

* + 1. Swept 1 (swe1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domains 1–13, 15–18, 20–28 |

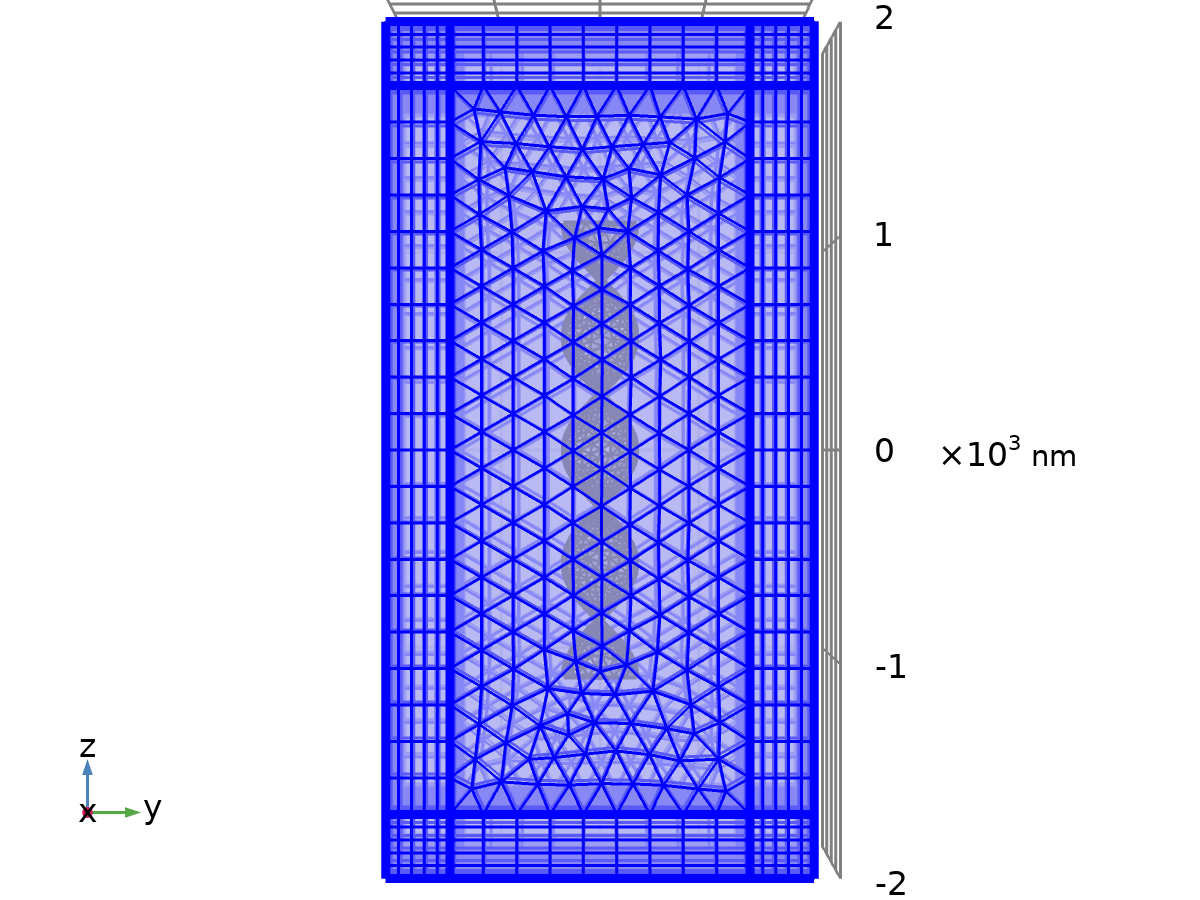


Swept 1

#### Distribution 1 (dis1)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: Domains 1–13, 15–18, 20–28 |

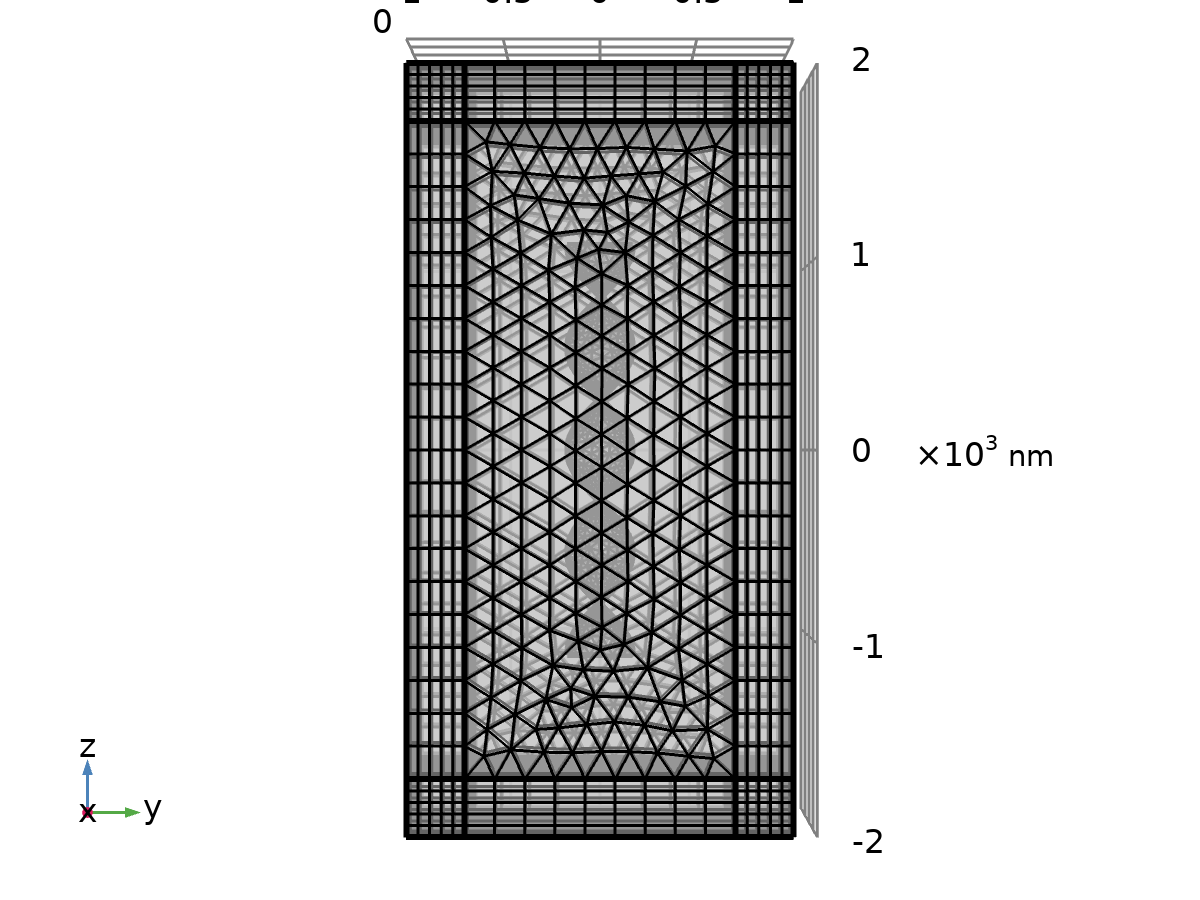


Distribution 1

#### Distribution 2 (dis2)

Selection

|  |  |
| --- | --- |
| Geometric entity level | Domain |
| Selection | Geometry geom1: Dimension 3: No domains |



Distribution 2

Settings

| **Description** | **Value** |
| --- | --- |
| Number of elements | 8 |

1. Study 2

Computation information

|  |  |
| --- | --- |
| Computation time | 10 min 1 s |

* 1. Parametric Sweep

| **Parameter name** | **Parameter value list** | **Parameter unit** |
| --- | --- | --- |
| wl | 1065E-9, 1095E-9, 1125E-9 | m |
| c | 1,-1 |  |

Study settings

| **Description** | **Value** |
| --- | --- |
| Sweep type | All combinations |
| Parameter name | {wl, c} |
| Unit | {m, } |

Parameters

| **Parameter name** | **Parameter value list** | **Parameter unit** |
| --- | --- | --- |
| wl (Wavelength) | 1065E-9, 1095E-9, 1125E-9 | m |
| c | 1,-1 |  |

* 1. Wavelength Domain

| **Wavelengths (µm)** |
| --- |
| wl |

Study settings

| **Description** | **Value** |
| --- | --- |
| Include geometric nonlinearity | Off |

Settings

| **Description** | **Value** |
| --- | --- |
| Wavelengths | 1.095E-6 |

Physics and variables selection

| **Physics interface** | **Discretization** |
| --- | --- |
| Electromagnetic Waves, Frequency Domain 2 (ewfd) | physics |

Mesh selection

| **Geometry** | **Mesh** |
| --- | --- |
| Geometry 1 (geom1) | mesh1 |

* 1. Wavelength Domain 1

| **Wavelengths (µm)** |
| --- |
| wl |

Study settings

| **Description** | **Value** |
| --- | --- |
| Include geometric nonlinearity | Off |

Settings

| **Description** | **Value** |
| --- | --- |
| Wavelengths | 1.095E-6 |

Physics and variables selection

| **Physics interface** | **Discretization** |
| --- | --- |
| Electromagnetic Waves, Frequency Domain 2a (ewfd2) | physics |

Mesh selection

| **Geometry** | **Mesh** |
| --- | --- |
| Geometry 1 (geom1) | mesh1 |

* 1. Solver Configurations
     1. Solution 1

#### Compile Equations: Wavelength Domain (st1)

Study and step

| **Description** | **Value** |
| --- | --- |
| Use study | [Study 2](#cs5084012) |
| Use study step | [Wavelength Domain](#cs8797412) |

#### Dependent Variables 1 (v1)

General

| **Description** | **Value** |
| --- | --- |
| Defined by study step | [Wavelength Domain](#cs8797412) |

Initial value calculation constants

| **Constant name** | **Initial value source** |
| --- | --- |
| lambda0 | wl |

##### Electric field (comp1.E) (comp1\_E)

General

| **Description** | **Value** |
| --- | --- |
| Field components | {comp1.Ex, comp1.Ey, comp1.Ez} |
| Solve for this field | Off |

##### Electric field (comp1.E2) (comp1\_E2)

General

| **Description** | **Value** |
| --- | --- |
| Field components | {comp1.E2x, comp1.E2y, comp1.E2z} |

##### S-parameter (comp1.Sparam1) (comp1\_Sparam1)

General

| **Description** | **Value** |
| --- | --- |
| State components | comp1.ewfd.S1x |

##### S-parameter (comp1.Sparam2) (comp1\_Sparam2)

General

| **Description** | **Value** |
| --- | --- |
| State components | comp1.ewfd.S2x |

#### Stationary Solver 1 (s1)

General

| **Description** | **Value** |
| --- | --- |
| Defined by study step | [Wavelength Domain](#cs8797412) |

Results while solving

| **Description** | **Value** |
| --- | --- |
| Probes | None |

##### Direct (dDef)

General

| **Description** | **Value** |
| --- | --- |
| Pivot threshold | 0.1 |
| Out-of-core | Off |

Error

| **Description** | **Value** |
| --- | --- |
| Factor in error estimate | 400 |

##### Advanced (aDef)

Assembly settings

| **Description** | **Value** |
| --- | --- |
| Allow complex-valued output from functions with real input | On |

##### Parametric 1 (p1)

General

| **Description** | **Value** |
| --- | --- |
| Defined by study step | [Wavelength Domain](#cs8797412) |
| Run continuation for | No parameter |
| Reuse solution from previous step | Auto |

Parameters

| **Parameter name** | **Parameter value list** | **Parameter unit** |
| --- | --- | --- |
| lambda0 | wl | µm |

##### Fully Coupled 1 (fc1)

General

| **Description** | **Value** |
| --- | --- |
| Linear solver | [Direct](#cs7467839) |

#### Compile Equations: Wavelength Domain 1 (st2)

Study and step

| **Description** | **Value** |
| --- | --- |
| Use study | [Study 2](#cs5084012) |
| Use study step | [Wavelength Domain 1](#cs2927739) |

#### Dependent Variables 2 (v2)

General

| **Description** | **Value** |
| --- | --- |
| Defined by study step | [Wavelength Domain 1](#cs2927739) |

Initial values of variables solved for

| **Description** | **Value** |
| --- | --- |
| Method | Solution |
| Solution | [Solution 1](#cs8619937) |

Values of variables not solved for

| **Description** | **Value** |
| --- | --- |
| Method | Solution |
| Solution | [Solution 1](#cs8619937) |

Initial value calculation constants

| **Constant name** | **Initial value source** |
| --- | --- |
| lambda0 | wl |

##### Electric field (comp1.E) (comp1\_E)

General

| **Description** | **Value** |
| --- | --- |
| Field components | {comp1.Ex, comp1.Ey, comp1.Ez} |

##### Electric field (comp1.E2) (comp1\_E2)

General

| **Description** | **Value** |
| --- | --- |
| Field components | {comp1.E2x, comp1.E2y, comp1.E2z} |
| Solve for this field | Off |

##### S-parameter (comp1.Sparam1) (comp1\_Sparam1)

General

| **Description** | **Value** |
| --- | --- |
| State components | comp1.ewfd.S1x |
| Solve for this state | Off |

##### S-parameter (comp1.Sparam2) (comp1\_Sparam2)

General

| **Description** | **Value** |
| --- | --- |
| State components | comp1.ewfd.S2x |
| Solve for this state | Off |

#### Stationary Solver 2 (s2)

General

| **Description** | **Value** |
| --- | --- |
| Defined by study step | [Wavelength Domain 1](#cs2927739) |

Results while solving

| **Description** | **Value** |
| --- | --- |
| Probes | None |

##### Direct (dDef)

General

| **Description** | **Value** |
| --- | --- |
| Pivot threshold | 0.1 |
| Out-of-core | Off |

Error

| **Description** | **Value** |
| --- | --- |
| Factor in error estimate | 400 |

##### Advanced (aDef)

Assembly settings

| **Description** | **Value** |
| --- | --- |
| Allow complex-valued output from functions with real input | On |

##### Parametric 1 (p1)

Parameters

| **Parameter name** | **Parameter value list** | **Parameter unit** |
| --- | --- | --- |
| lambda0 | wl | µm |

General

| **Description** | **Value** |
| --- | --- |
| Run continuation for | No parameter |
| Reuse solution from previous step | Auto |

##### Fully Coupled 1 (fc1)

General

| **Description** | **Value** |
| --- | --- |
| Linear solver | [Direct](#cs7792091) |

* + 1. Parametric Solutions 2

#### wl=1.065E-6, c=1 (su1)

General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.065E-6, c=1 |

#### wl=1.065E-6, c=-1 (su2)

General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.065E-6, c= - 1 |

#### wl=1.095E-6, c=1 (su3)

General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.095E-6, c=1 |

#### wl=1.095E-6, c=-1 (su4)

General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.095E-6, c= - 1 |

#### wl=1.125E-6, c=1 (su5)

General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.125E-6, c=1 |

#### wl=1.125E-6, c=-1 (su6)

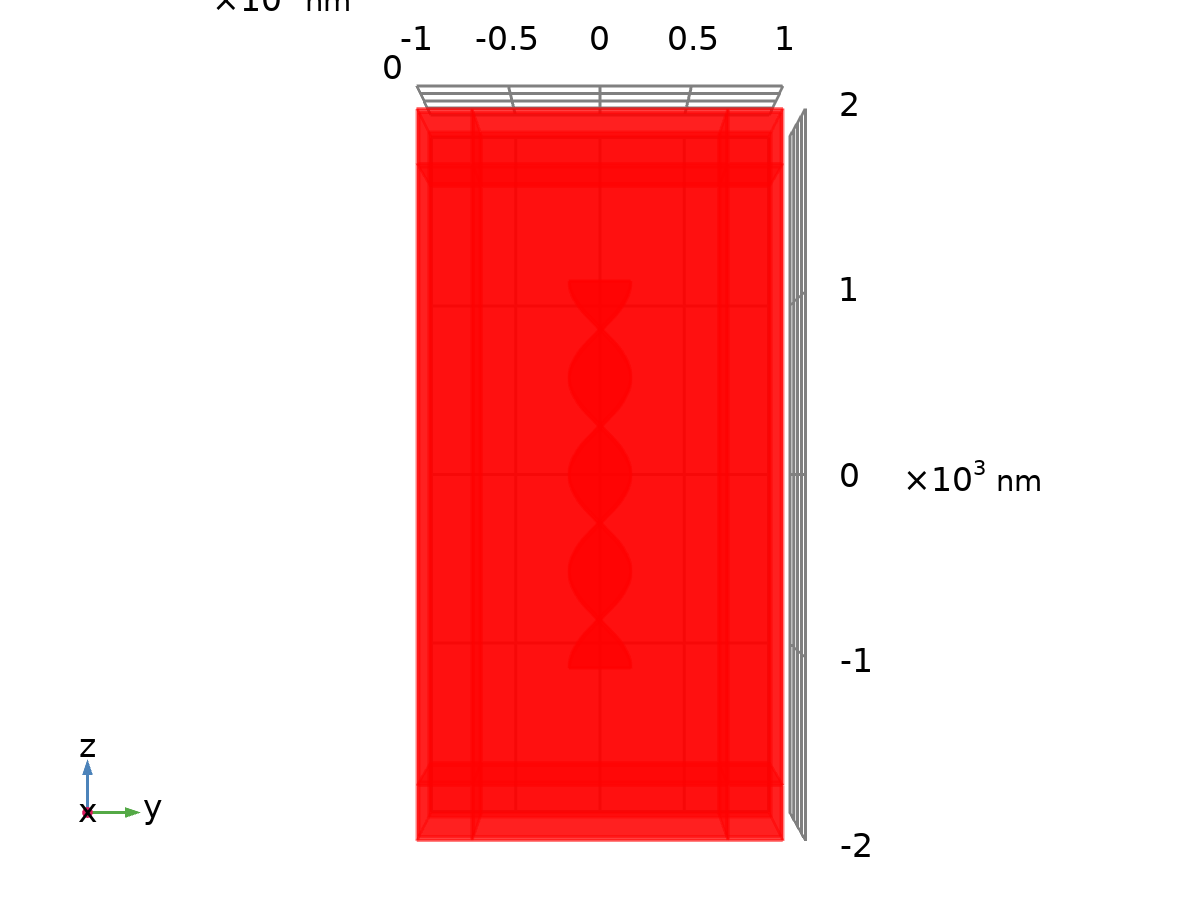
General

| **Description** | **Value** |
| --- | --- |
| Solution | wl=1.125E-6, c= - 1 |

1. Results
   1. Data Sets
      1. Study 2/Solution 1

Solution

| **Description** | **Value** |
| --- | --- |
| Solution | [Solution 1](#cs8619937) |
| Component | Component 1 (comp1) |



Dataset: Study 2/Solution 1

* + 1. Study 2/Parametric Solutions 1

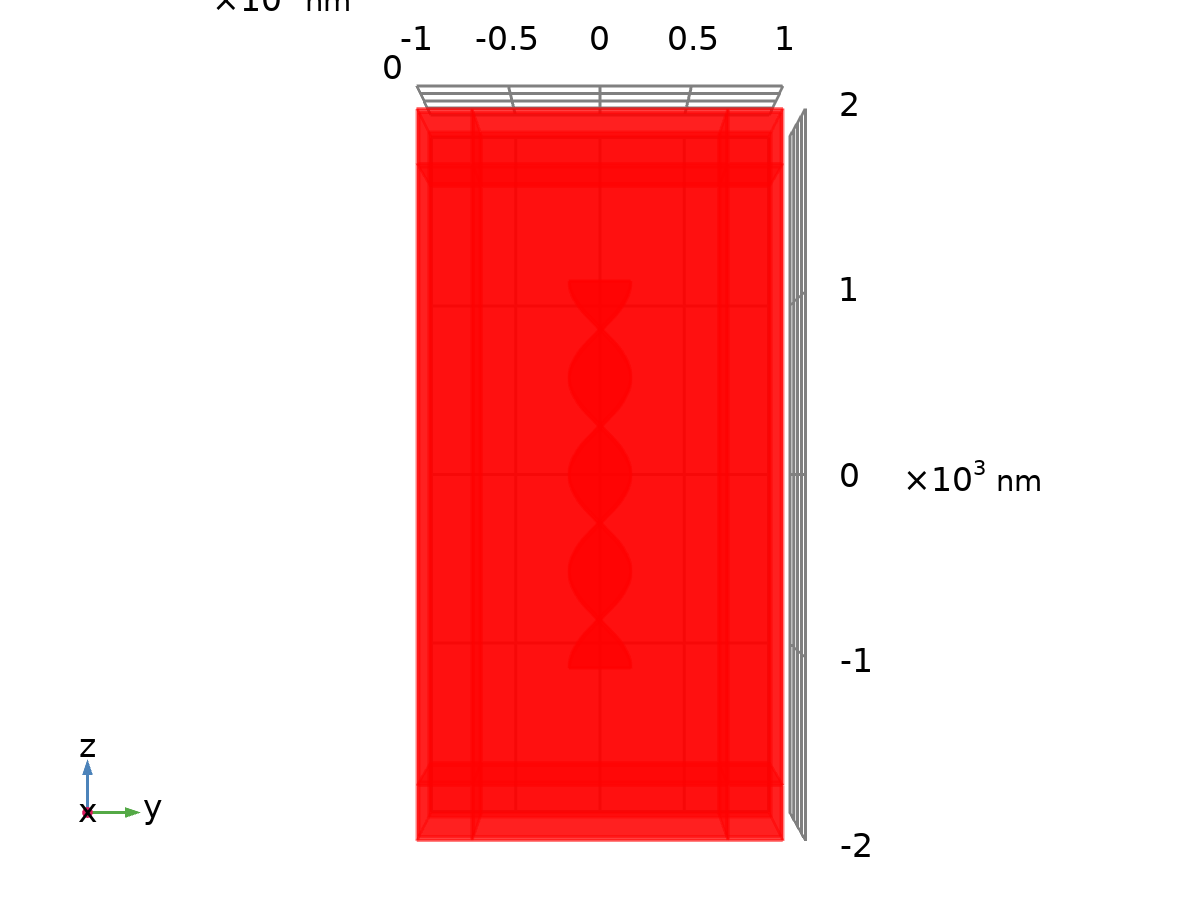
Solution

| **Description** | **Value** |
| --- | --- |
| Solution | [Parametric Solutions 1](#cs7317827) |
| Component | Component 1 (comp1) |

* + 1. Study 2/Parametric Solutions 2

Solution

| **Description** | **Value** |
| --- | --- |
| Solution | [Parametric Solutions 2](#cs2263091) |
| Component | Component 1 (comp1) |



Dataset: Study 2/Parametric Solutions 2

* 1. Tables
     1. Evaluation 3D

Interactive 3D values

| **x** | **y** | **z** | **Value** |
| --- | --- | --- | --- |
| 4.1074E-7 | -7.2723E-7 | -4.1687E-7 | 9.4267E-7 |
| -7.1678E-7 | -2.1054E-6 | -3.0655E-6 | 3.7916E-6 |

* + 1. Directivity

Radiation pattern

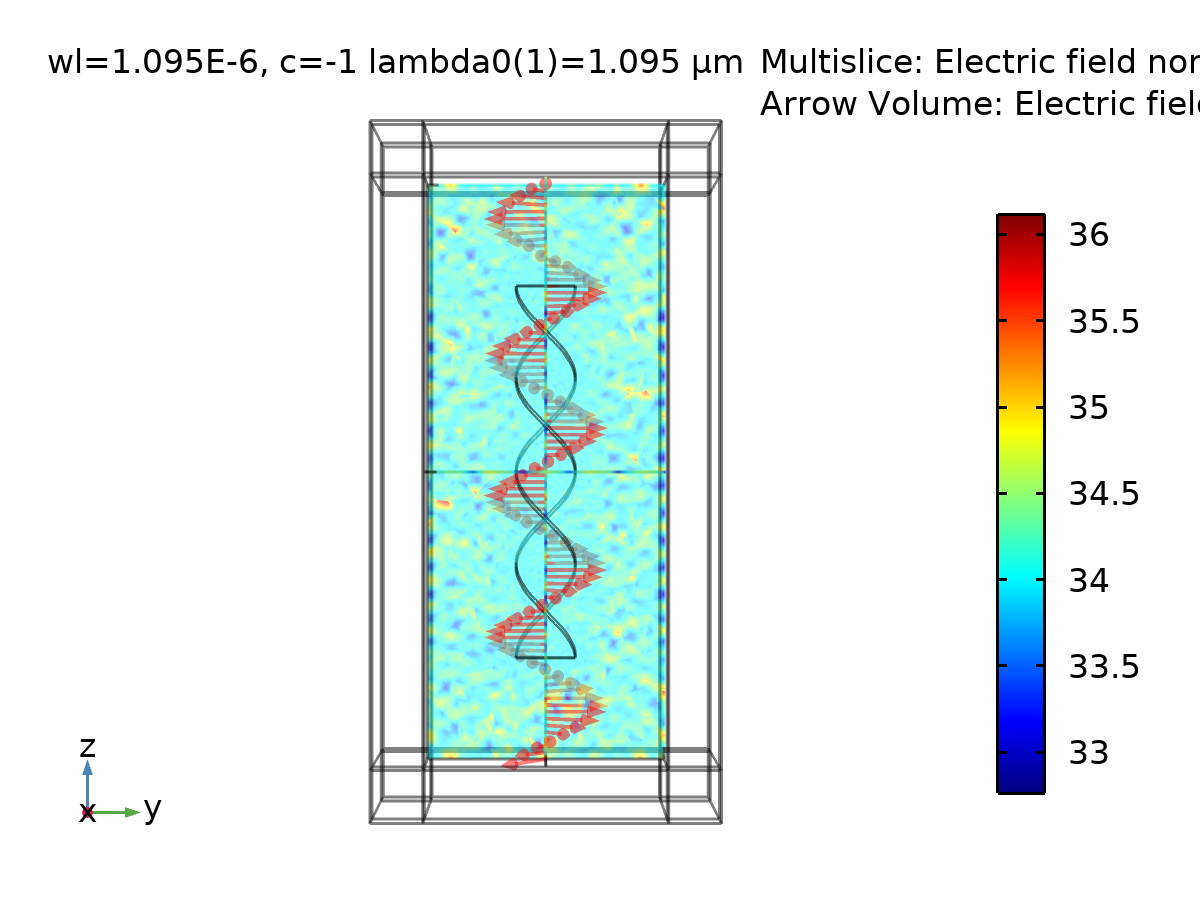
| **θ (deg)** | **φ (deg)** | **Directivity** | **Directivity (dB)** |
| --- | --- | --- | --- |
| 180.00 | 96.000 | 13.396 | 11.270 |

* + 1. Directivity 1

Radiation pattern

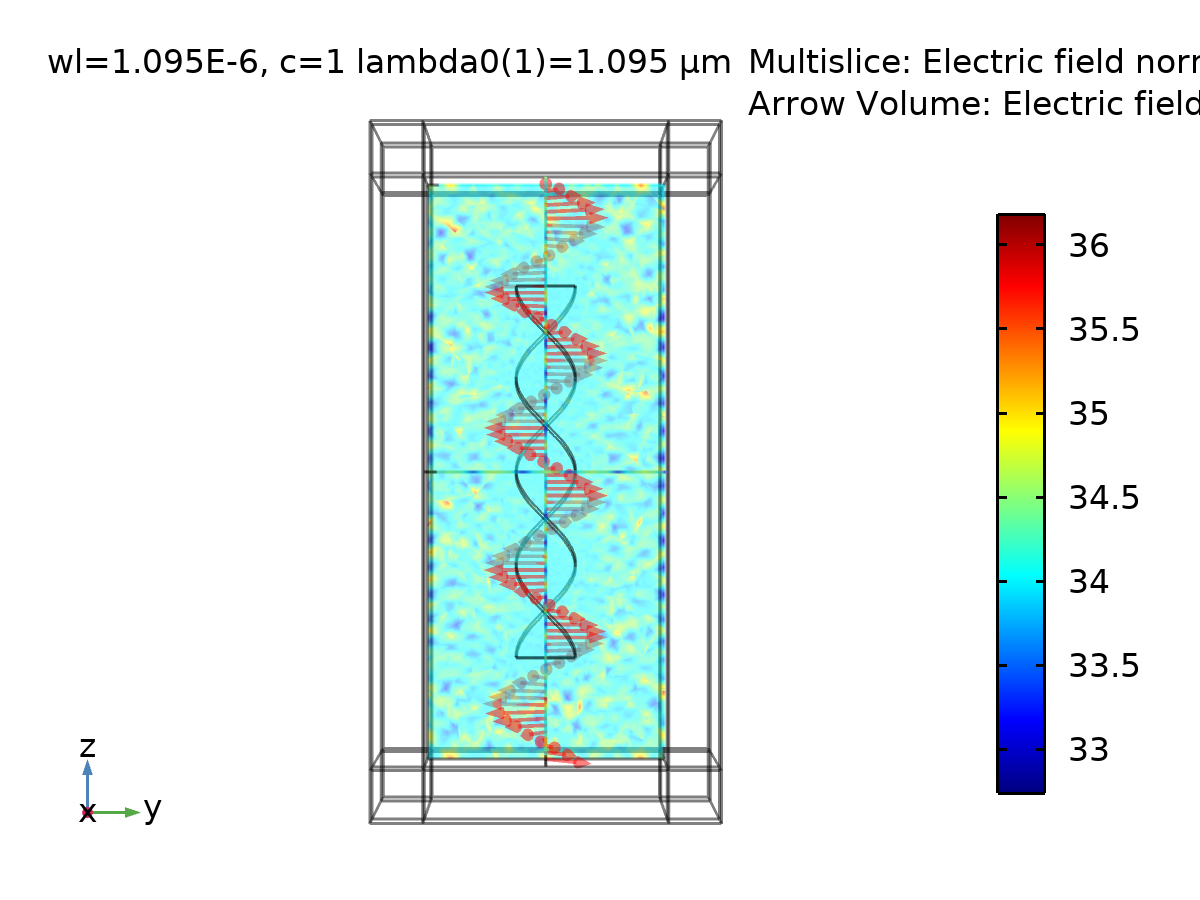
| **θ (deg)** | **φ (deg)** | **Directivity** | **Directivity (dB)** |
| --- | --- | --- | --- |
| 180.00 | 48.000 | 11.080 | 10.446 |

* 1. Plot Groups
     1. Electric Field (ewfd)



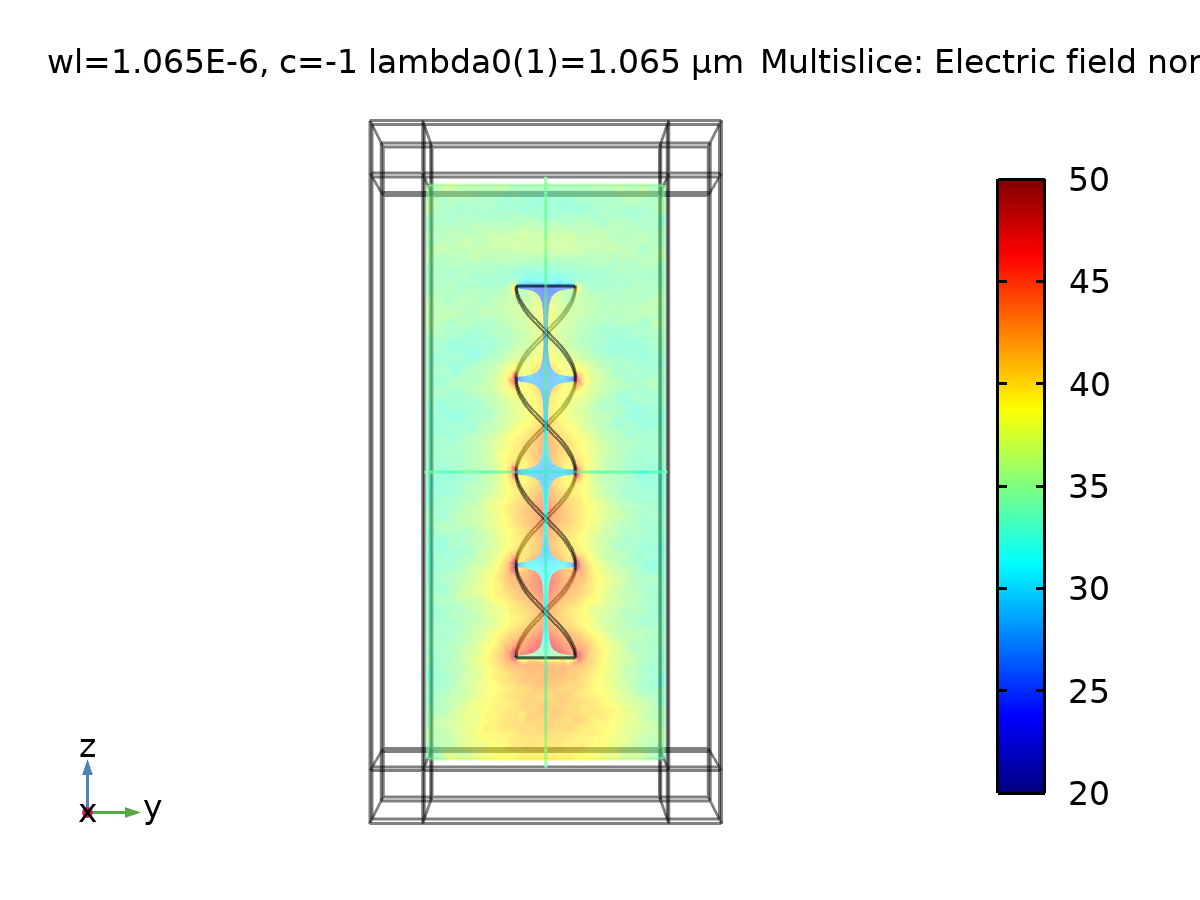
Multislice: Electric field norm (V/m) Arrow Volume: Electric field

* + 1. Electric Field (ewfd) 2



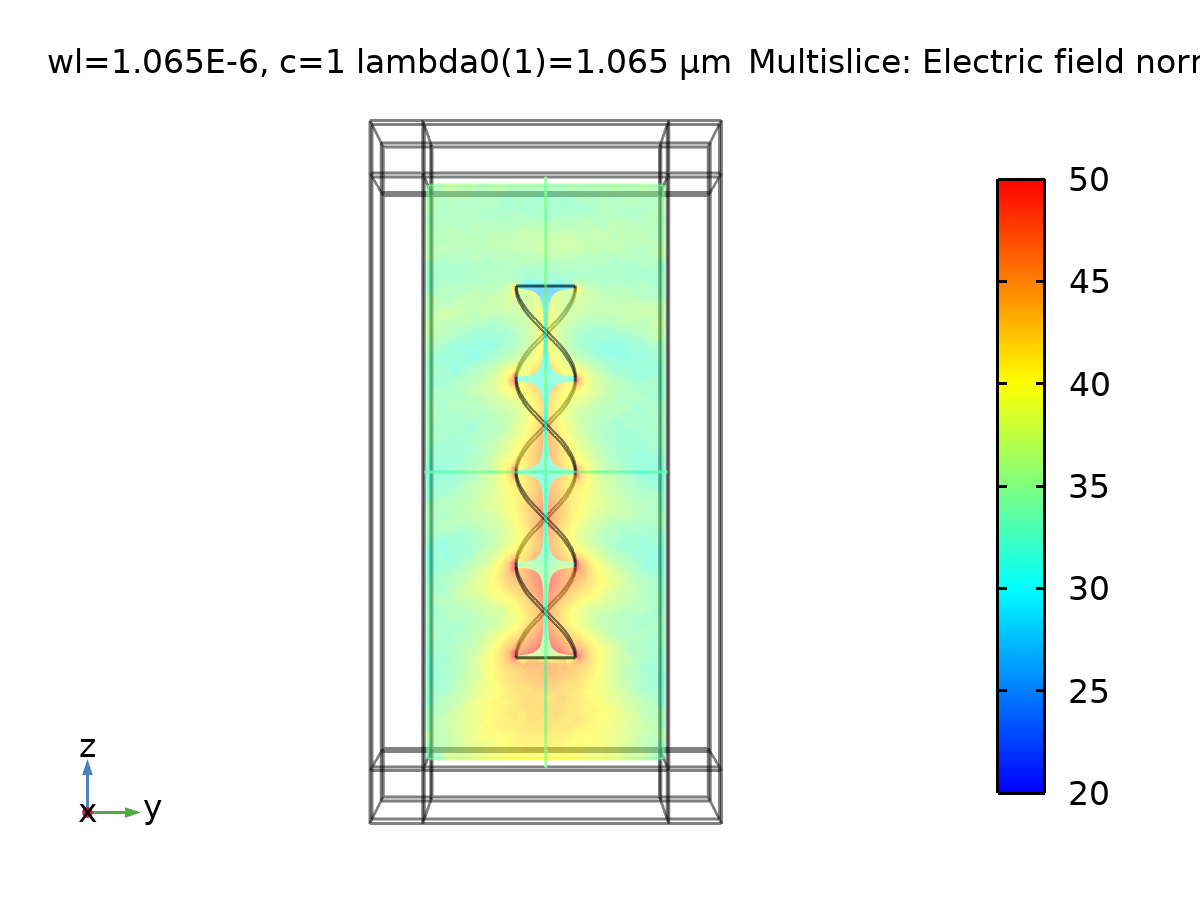
Multislice: Electric field norm (V/m) Arrow Volume: Electric field

* + 1. Electric Field (ewfd2)



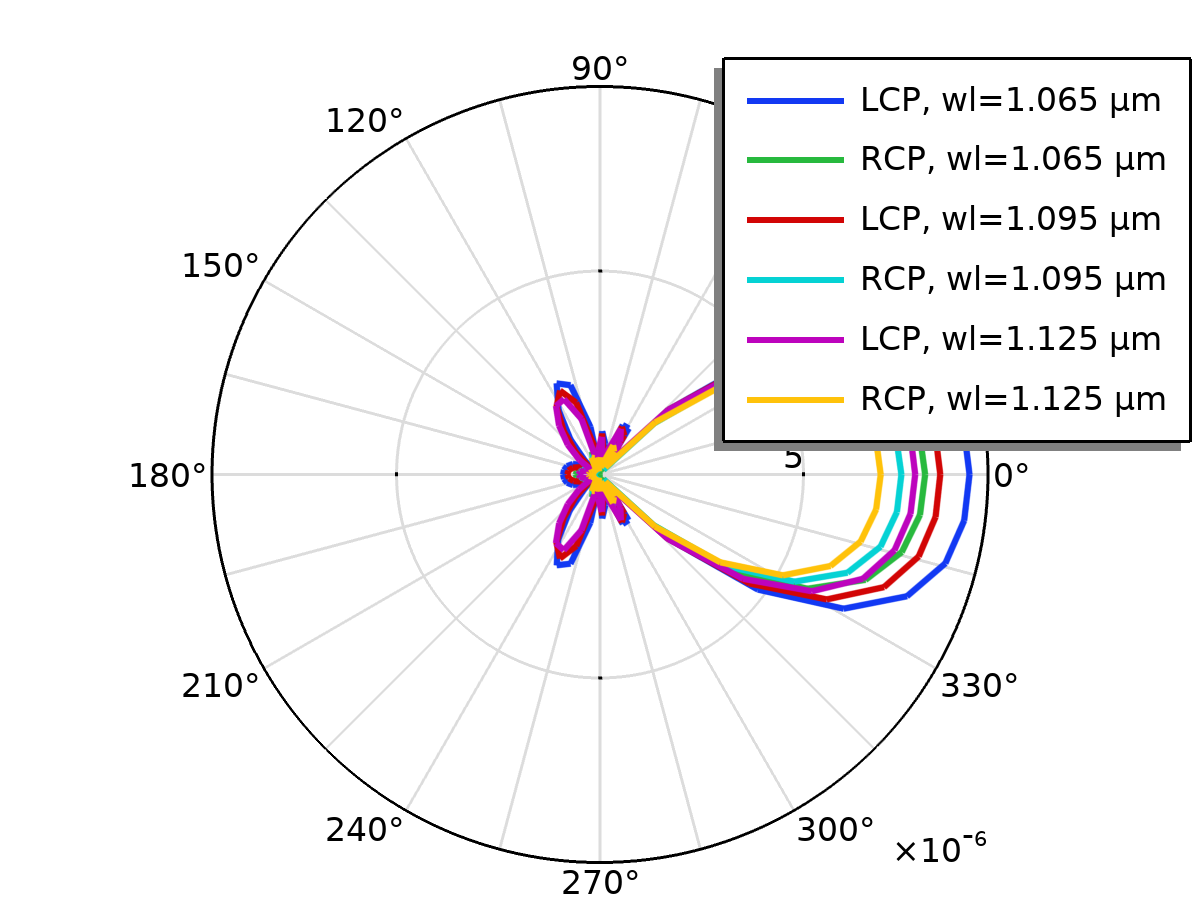
Multislice: Electric field norm (V/m)

* + 1. Electric Field (ewfd2) 1

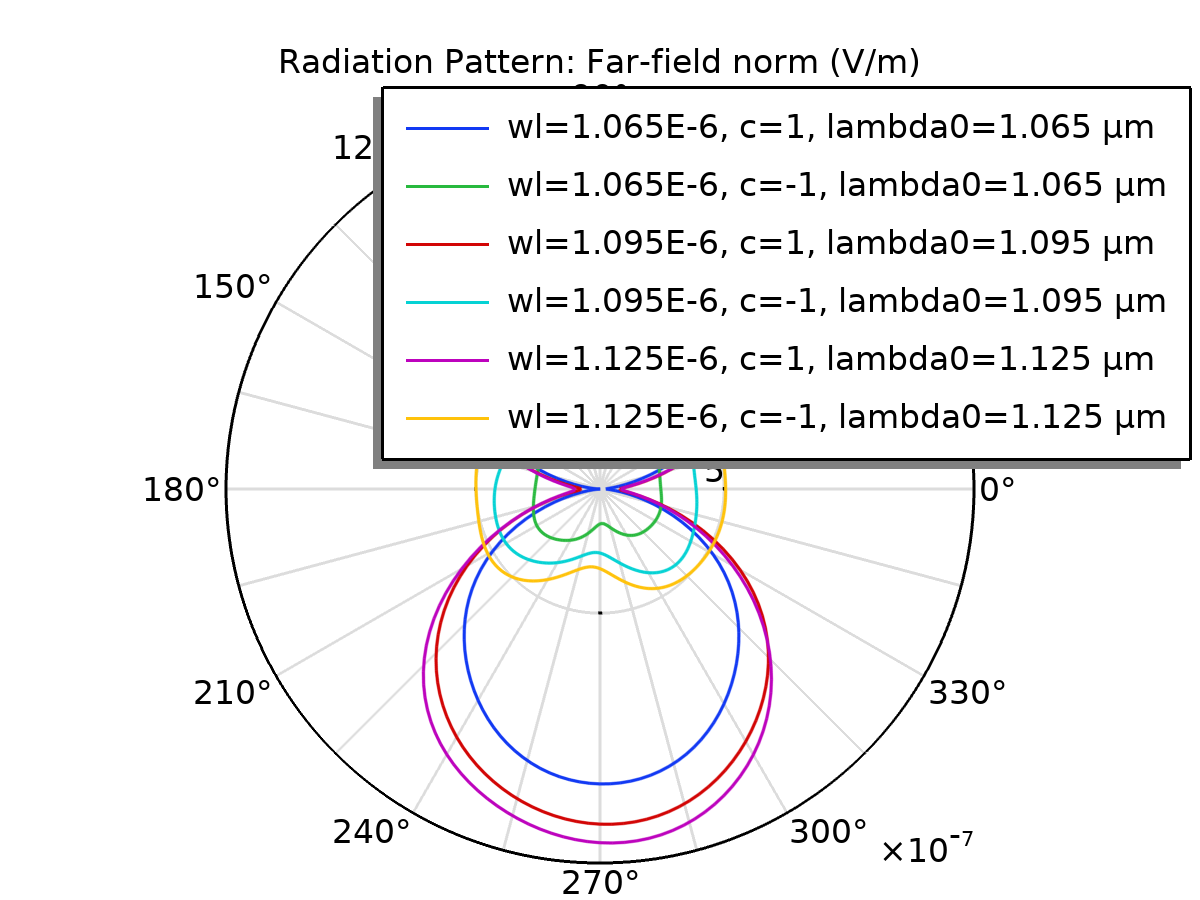


Multislice: Electric field norm (V/m)

* + 1. Polar Plot Group 12

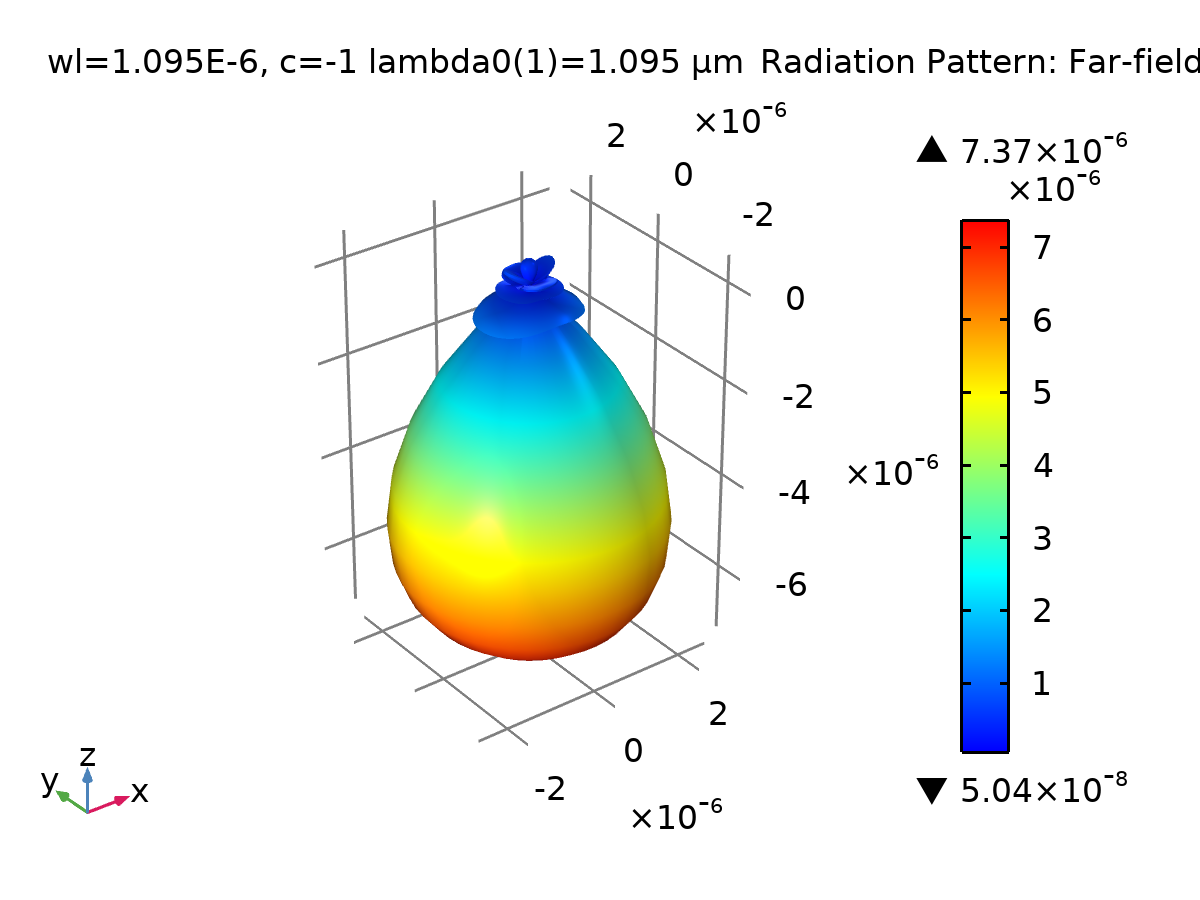


* + 1. 2D Far Field (ewfd2)



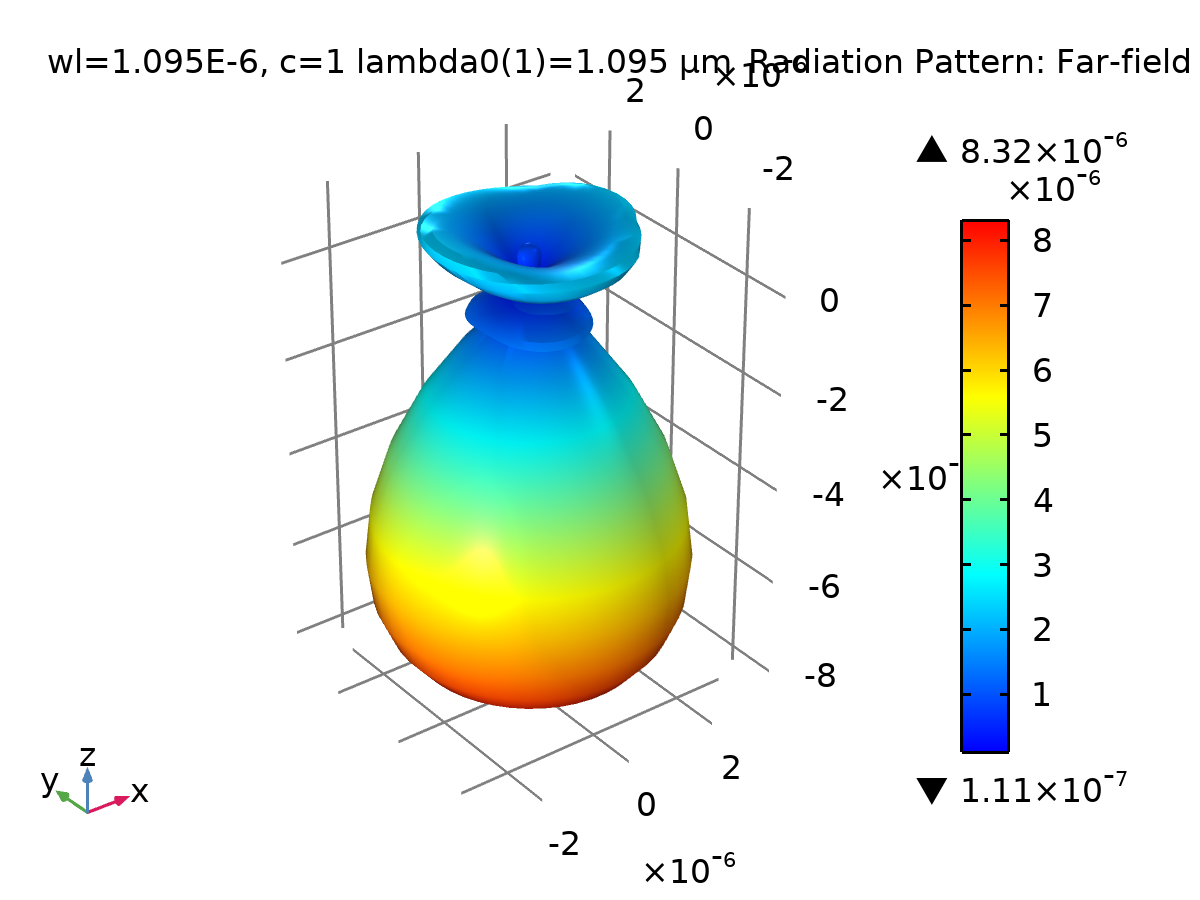
Radiation Pattern: Far-field norm (V/m)

* + 1. 3D Far Field (ewfd2)



Radiation Pattern: Far-field norm (V/m)

* + 1. 3D Far Field (ewfd2) 1



Radiation Pattern: Far-field norm (V/m)