Two Core Bow Tie Fiber (TC BTie)

Report date	May 9, 2026, 5:28:01 PM

Contents

1 Global Definitions

Date	Apr 21, 2026, 12:08:25 AM

GLOBAL SETTINGS

Version	COMSOL Multiphysics 6.3 (Build: 290)

USED PRODUCTS

COMSOL Multiphysics
Structural Mechanics Module
Wave Optics Module

1.1 PARAMETERS

PARÁMETROS 1

Name	Expression	Value	Description
nSiO2	1.44471	1.4447	Refractive index, silica (SiO2)
nCore	1.45001	1.45	Relative index difference
nWater	1.31056	1.3106	Refractive index, core (doped SiO2)
B1	0.65e-12[m^2/N]	6.5E−13 1/Pa	First stress optical coefficient
B2	4.2e-12[m^2/N]	4.2E−12 1/Pa	Second stress optical coefficient
T1	80[degC]	353.15 K	Operating temperature
T0	20[degC]	293.15 K	Reference temperature
lambda0_ewfd	1.55[um]	1.55E−6 m	Free space wavelength
para	1	1	
CTEW	640e-6	6.4E−4	
EW	2.2e9	2.2E9	

2 Componente 1

SETTINGS

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

2.1 DEFINITIONS

2.1.1 Variables

CORE2

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 8–9

Name	Expression	Unit	Description
N	nCore		

CLADD

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–3, 5–6

Name	Expression	Unit	Description
N	nSiO2		

WATER

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 4, 7

Name	Expression	Unit	Description
N	nWater		

Variables 3

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

Name	Expression	Unit	Description
Nx	N - 1*(B1*solid.sx + B2*(solid.sy + solid.sz))		
Ny	N - 1*(B1*solid.sy + B2*(solid.sx + solid.sz))		
Nz	N - 1*(B1*solid.sz + B2*(solid.sx + solid.sy))		

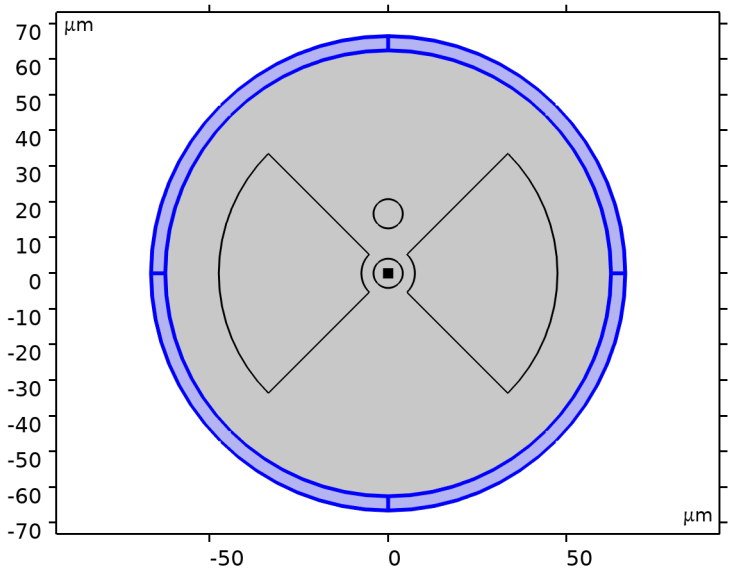
2.1.2 Artificial Domains

Perfectly Matched Layer 1

Tag	pml1

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–2, 5–6



Selection

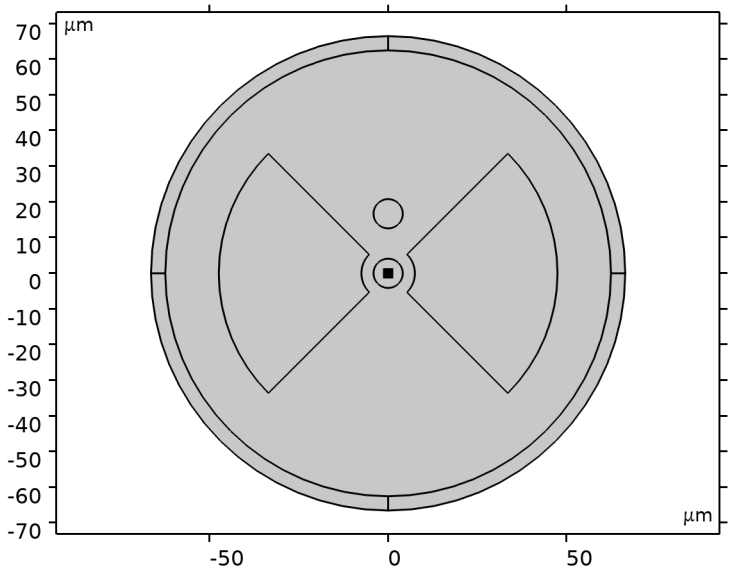
GEOMETRY

Description	Value
Type	Cylindrical

SCALING

Description	Value
Coordinate stretching type	Polynomial
Typical wavelength from	User defined
Typical wavelength	1.55[um]

2.2 GEOMETRÍA 1



Geometría 1

UNITS

Length unit	µm
Angular unit	deg

2.2.1 Import 3 (imp3)

SOURCE

Description	Value
Source	DXF file
Filename	D:\DC y otros\2D 3CF AND 7CF\DC_bow tie_paper.DXF

INFORMATION

Description	Value
Build message	Imported 1 solid object from D:\DC y otros\2D 3CF AND 7CF\DC_bow tie_paper.DXF.

2.2.2 Circle 3 (c3)

SIZE AND SHAPE

Description	Value
Radius	62.5

POSITION

Description	Value

Description	Value
Position	{0, 0}

2.2.3 Circle 1 (c1)

SIZE AND SHAPE

Description	Value
Radius	66.5

POSITION

Description	Value
Position	{0, 0}

LAYERS

Layer name	Thickness (µm)
Layer 1	4

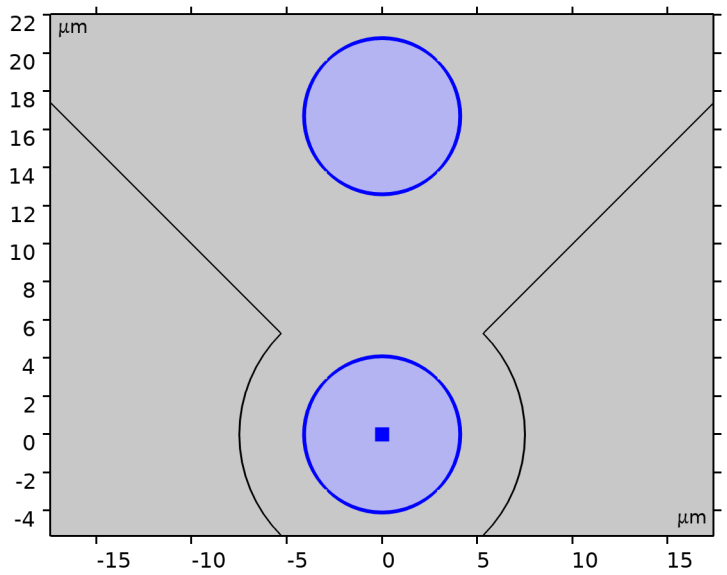
2.2.4 Formar unión (fin)

INFORMATION

Description	Value
Build message	Formed union of 3 solid objects. Union has 9 domains, 28 boundaries, and 25 vertices.

2.3 MATERIALS

2.3.1 CORE2

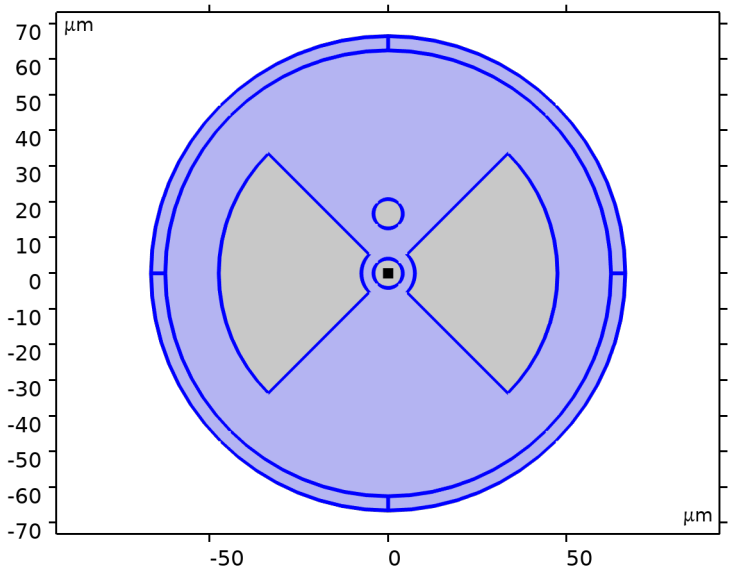


CORE2

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 8–9

2.3.2 CLADD



CLADD

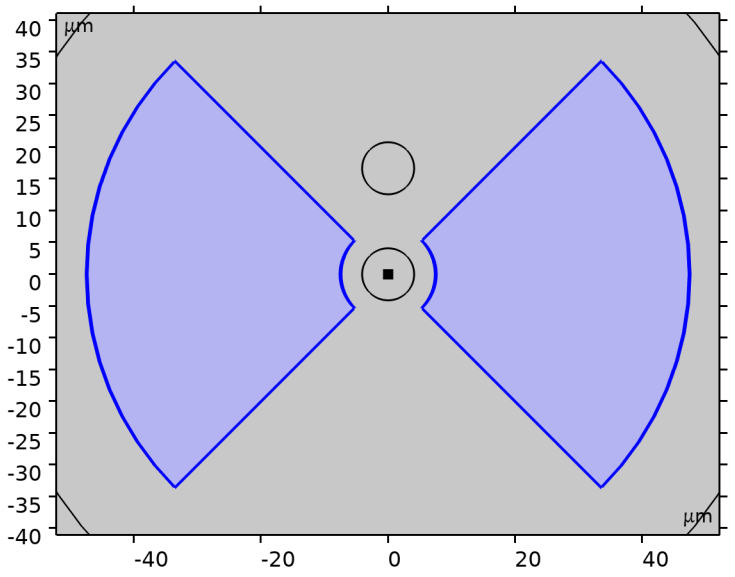
SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–3, 5–6

MATERIAL PARAMETERS

Name	Value	Unit	Property group
Young's modulus	7.8E10	Pa	Basic
Coefficient of thermal expansion	5.4E-7	1/K	Basic
Poisson's ratio	0.17	1	Basic
Density	2203	kg/m³	Basic
Refractive index, imaginary part	0	1	Refractive index

2.3.3 WATER



WATER

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 4, 7

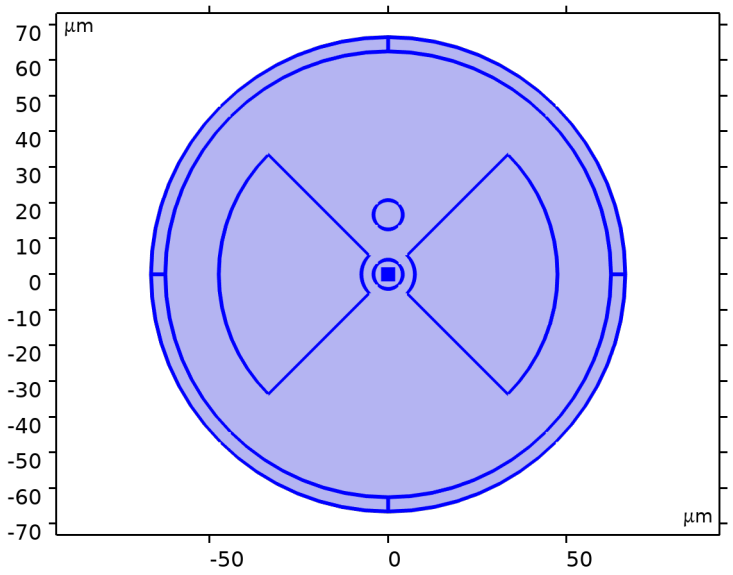
MATERIAL PARAMETERS

Name	Value	Unit	Property group
Poisson's ratio	0.49	1	Basic
Density	950	kg/m^3	Basic
Young's modulus	EW	Pa	Basic
Coefficient of thermal expansion	CTEW	1/K	Basic
Refractive index, imaginary part	0	1	Refractive index

2.4 SOLID MECHANICS

USED PRODUCTS

COMSOL Multiphysics
Structural Mechanics Module



Solid Mechanics

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

2.4.1 Interface Settings

Physics Symbols

SETTINGS

Description	Value
Enable physics symbols	Off

Discretization

SETTINGS

Description	Value
Displacement field	Quadratic serendipity

2D Approximation

SETTINGS

Description	Value
2D approximation	Plane stress

SETTINGS

Description	Value	Unit
Thickness	0.05	m

Structural Transient Behavior

SETTINGS

Description	Value
Structural transient behavior	Include inertial terms

Transient Solver Settings

SETTINGS

Description	Value
Description	Changes made to these settings only take effect when the default solver is generated.
Maximum frequency to resolve	Off

Typical Wave Speed for Perfectly Matched Layers

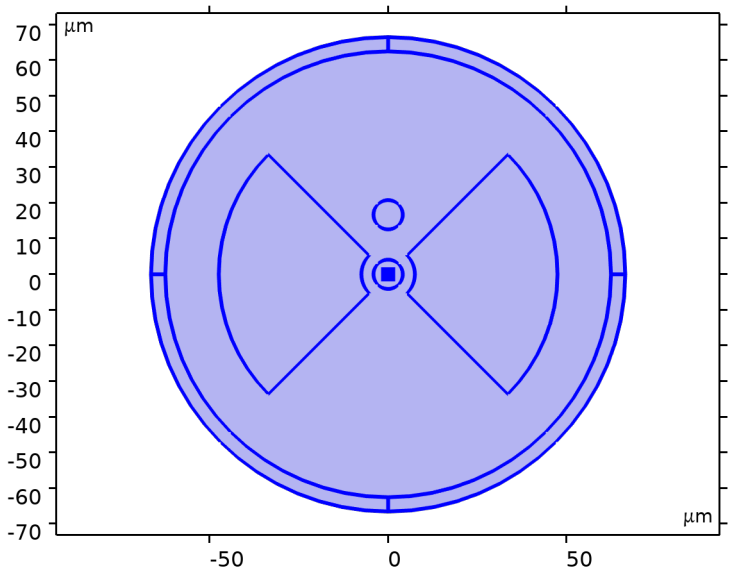
SETTINGS

Description	Value	Unit
Typical wave speed for perfectly matched layers	solid.cp	m/s

2.5 ONDAS ELECTROMAGNÉTICAS, DOMINIO DE LA FRECUENCIA

USED PRODUCTS

COMSOL Multiphysics
Wave Optics Module



Ondas electromagnéticas, dominio de la frecuencia

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: All domains

2.5.1 Interface Settings

Discretization

SETTINGS

Description	Value
Electric field	Quadratic

Physics-Controlled Mesh

SETTINGS

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

SETTINGS

Description	Value
Electric field components solved for	Three-component vector

Formulation

SETTINGS

Description	Value
	Full field

Port Sweep Settings

SETTINGS

Description	Value
Use manual port sweep	Off

SETTINGS

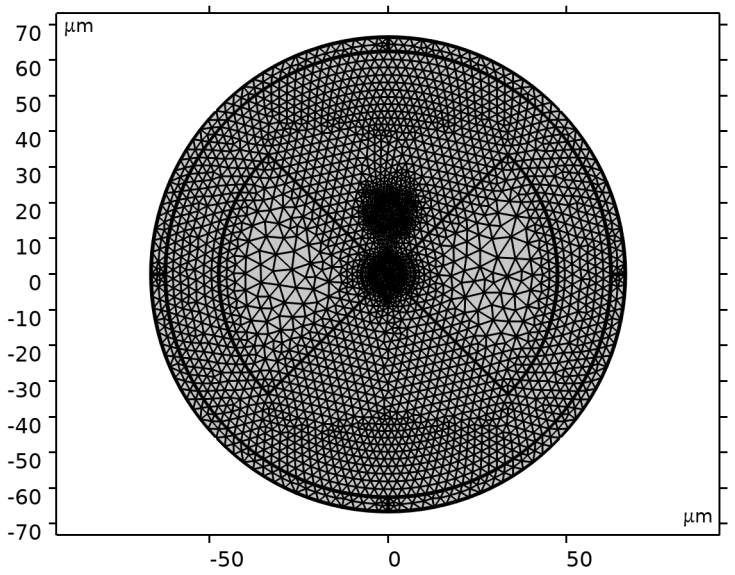
Description	Value	Unit
Out-of-plane wave number	ewfd.kz	rad/m
Description	This parameter is not used for the Mode analysis study step.	

Port Options

SETTINGS

Description	Value
Port formulation	Constraint - based

2.6 MALLA 1



Malla 1

2.6.1 Size (size)

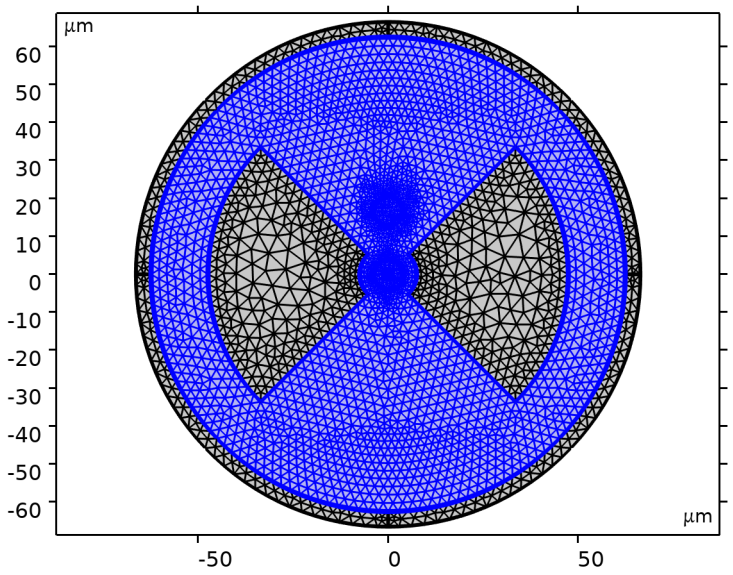
SETTINGS

Description	Value
Maximum element size	2.66
Minimum element size	0.00998
Curvature factor	0.25
Maximum element growth rate	1.2
Predefined size	Extra fine

2.6.2 Free Triangular 1 (ftri1)

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 3, 8–9



Free Triangular 1

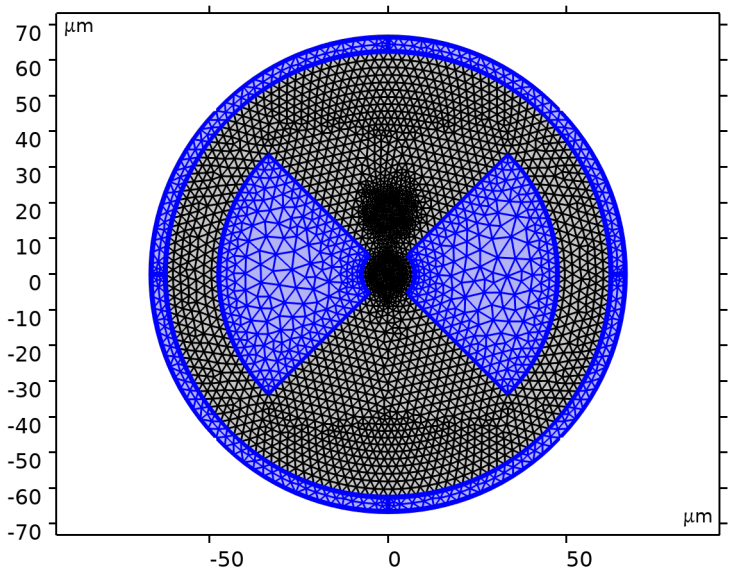
INFORMATION

Description	Value
Last build time	< 1 second
Built with	COMSOL 6.3.0.290 (win64), Apr 21, 2026, 5:21:03 PM

2.6.3 Size 1 (size1)

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–2, 4–7



Size 1

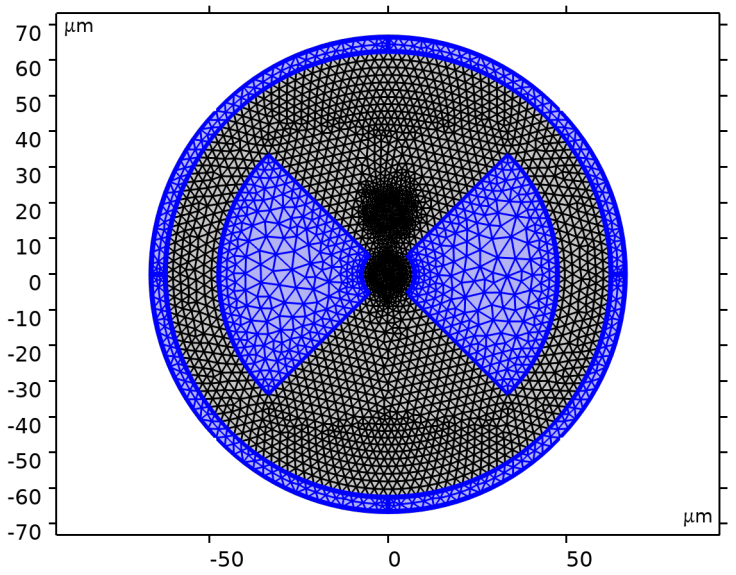
SETTINGS

Description	Value
Maximum element size	8.91
Minimum element size	0.0399
Curvature factor	0.3
Maximum element growth rate	1.3

2.6.4 Free Triangular 2 (ftri2)

SELECTION

Geometric entity level	Domain
Selection	Geometry geom1: Dimension 2: Domains 1–2, 4–7



Free Triangular 2

INFORMATION

Description	Value
Last build time	< 1 second
Built with	COMSOL 6.3.0.290 (win64), Apr 21, 2026, 5:21:03 PM

3 Study 1

COMPUTATION INFORMATION

Computation time	16 s

3.1 PARAMETRIC SWEEP

STUDY SETTINGS

Description	Value
Sweep type	Specified combinations

3.2 STATIONARY

STUDY SETTINGS

Description	Value
Include geometric nonlinearity	Off

PHYSICS AND VARIABLES SELECTION

Key	Solve for
Solid Mechanics (solid)	On
Ondas electromagnéticas, dominio de la frecuencia (ewfd)	Off

STORE IN OUTPUT

Interface	Output	Selection
Solid Mechanics (solid)	Physics controlled	
Ondas electromagnéticas, dominio de la frecuencia (ewfd)	Physics controlled	

MESH SELECTION

Component	Mesh
Componente 1	Malla 1

3.3 MODE ANALYSIS

STUDY SETTINGS

Description	Value
Include geometric nonlinearity	Off

STUDY SETTINGS

Description	Value
Transform	Effective mode index
Mode analysis frequency	c_const/1550[nm]
Desired number of modes	4

Description	Value
Desired number of modes	On
Unit	
Search for modes around shift	1.45
Search for modes around shift	On

VALUES OF LINEARIZATION POINT

Description	Value
Settings	User controlled
Method	Solution
Study	Study 1, Stationary

PHYSICS AND VARIABLES SELECTION

Key	Solve for
Solid Mechanics (solid)	Off
Ondas electromagnéticas, dominio de la frecuencia (ewfd)	On

STORE IN OUTPUT

Interface	Output	Selection
Solid Mechanics (solid)	Physics controlled	
Ondas electromagnéticas, dominio de la frecuencia (ewfd)	Physics controlled	

MESH SELECTION

Component	Mesh
Componente 1	Malla 1

SETTINGS

Description	Value
Sort based on transformed eigenvalues	Off

4 Resultados

4.1 VALORES DERIVADOS

4.1.1 Global Evaluation 1

OUTPUT

Evaluated in	Table 9

DATA

Description	Value
Dataset	Study 1/Solution 1 (sol1)

EXPRESSIONS

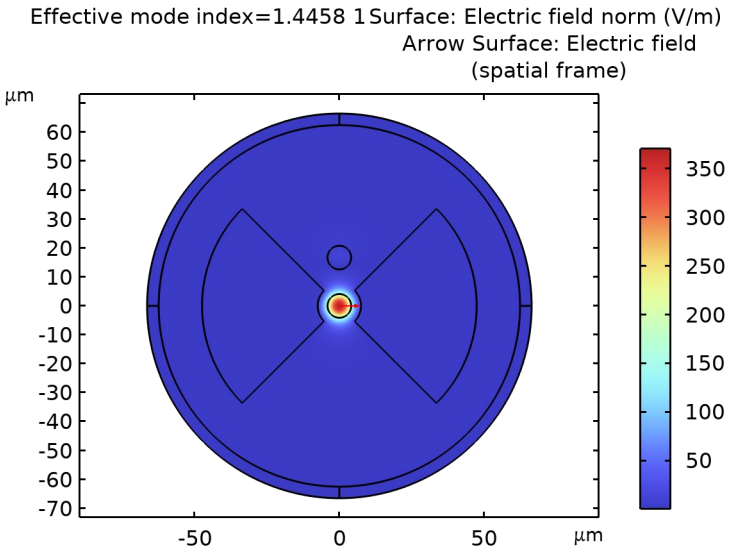
Expression	Unit	Description
ewfd.beta	rad/m	Propagation constant

EXPRESSIONS

Name	Value	Unit	Description
solid.refpntx	0	m	Reference point for moment computation, x-coordinate
solid.refpnty	0	m	Reference point for moment computation, y-coordinate
solid.refpntz	0	m	Reference point for moment computation, z-coordinate

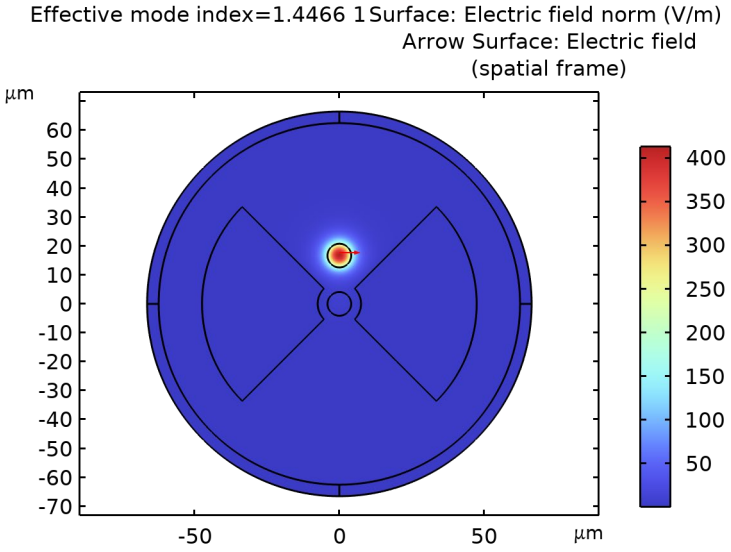
4.2 PLOT GROUPS

4.2.1 Electric Field (ewfd)



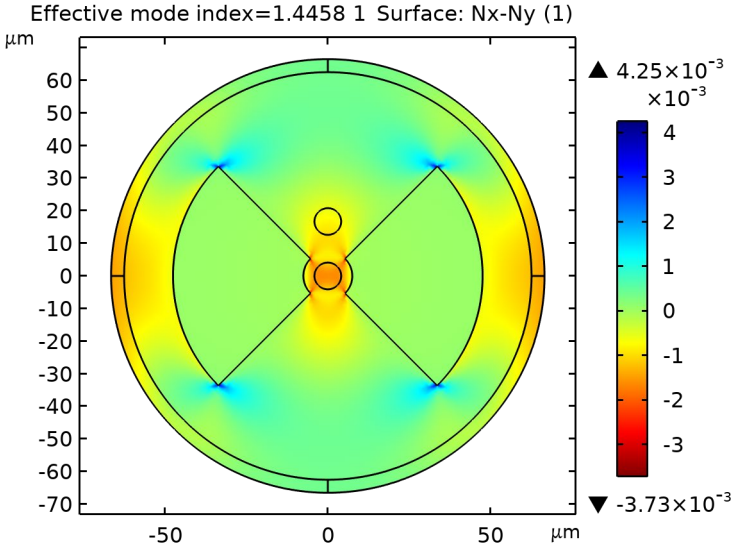
Surface: Electric field norm (V/m) Arrow Surface: Electric field (spatial frame)

4.2.2 Electric Field (ewfd) 1



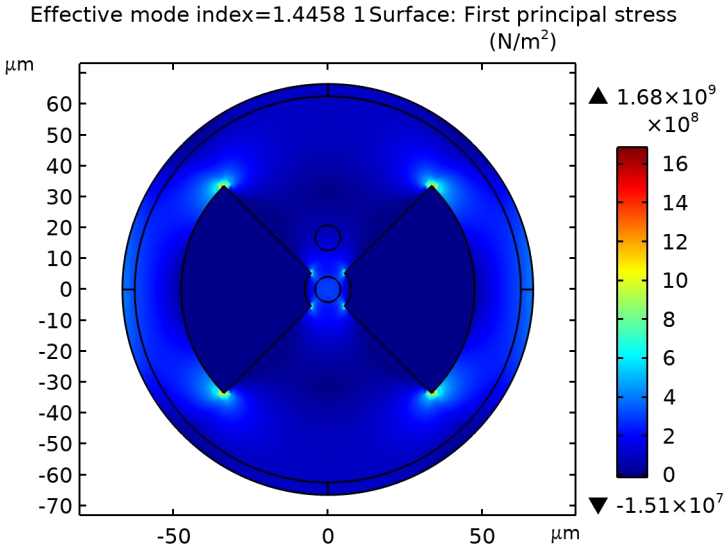
Surface: Electric field norm (V/m) Arrow Surface: Electric field (spatial frame)

4.2.3 Birrefringencia



Surface: Nx-Ny (1)

4.2.4 Stress (solid) 1



Surface: First principal stress (N/m²)