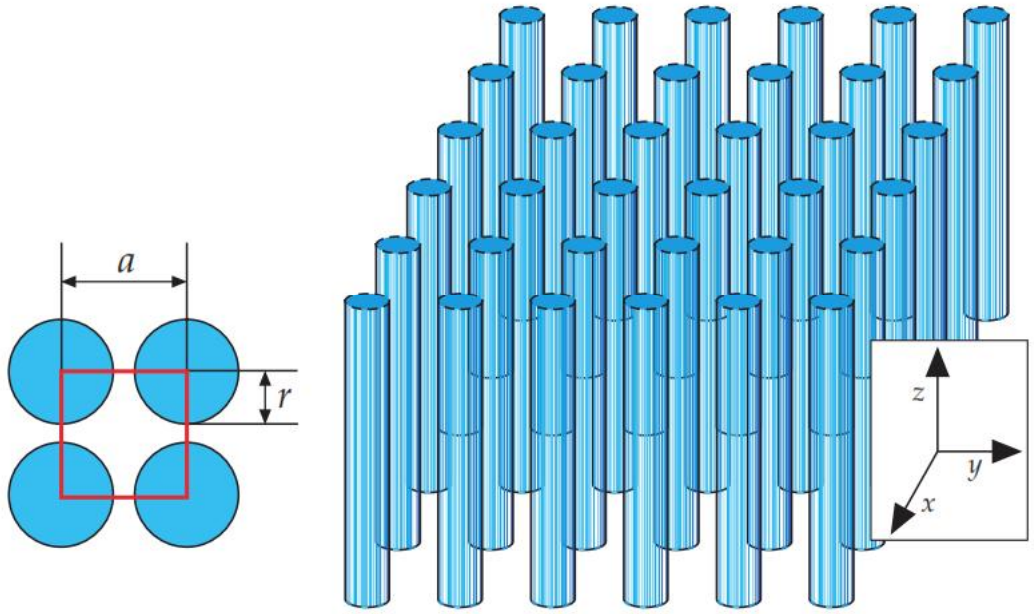
Estudio de cristales fotónicos 2D



$$\mathbf{H}_{\mathbf{k}}(\mathbf{r}) = e^{i\mathbf{k}\cdot\mathbf{r}}\mathbf{u}_{\mathbf{k}}(\mathbf{r}) = e^{i\mathbf{k}\cdot\mathbf{r}}\mathbf{u}_{\mathbf{k}}(\mathbf{r}+\mathbf{R})$$

Estudio de cristales fotónicos 2D

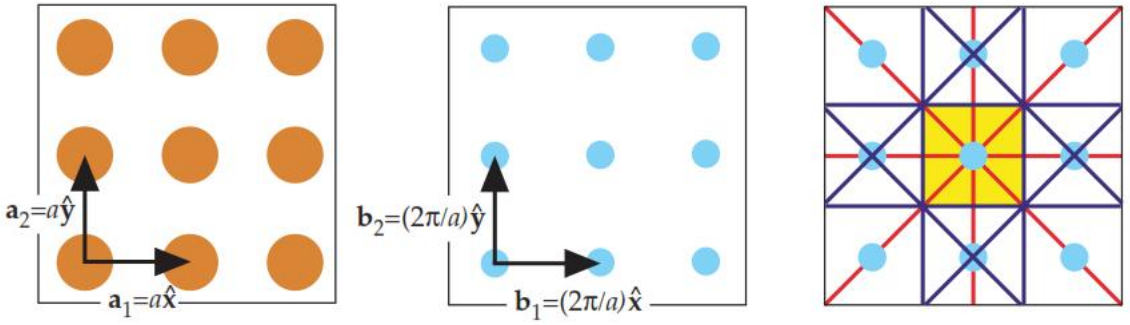


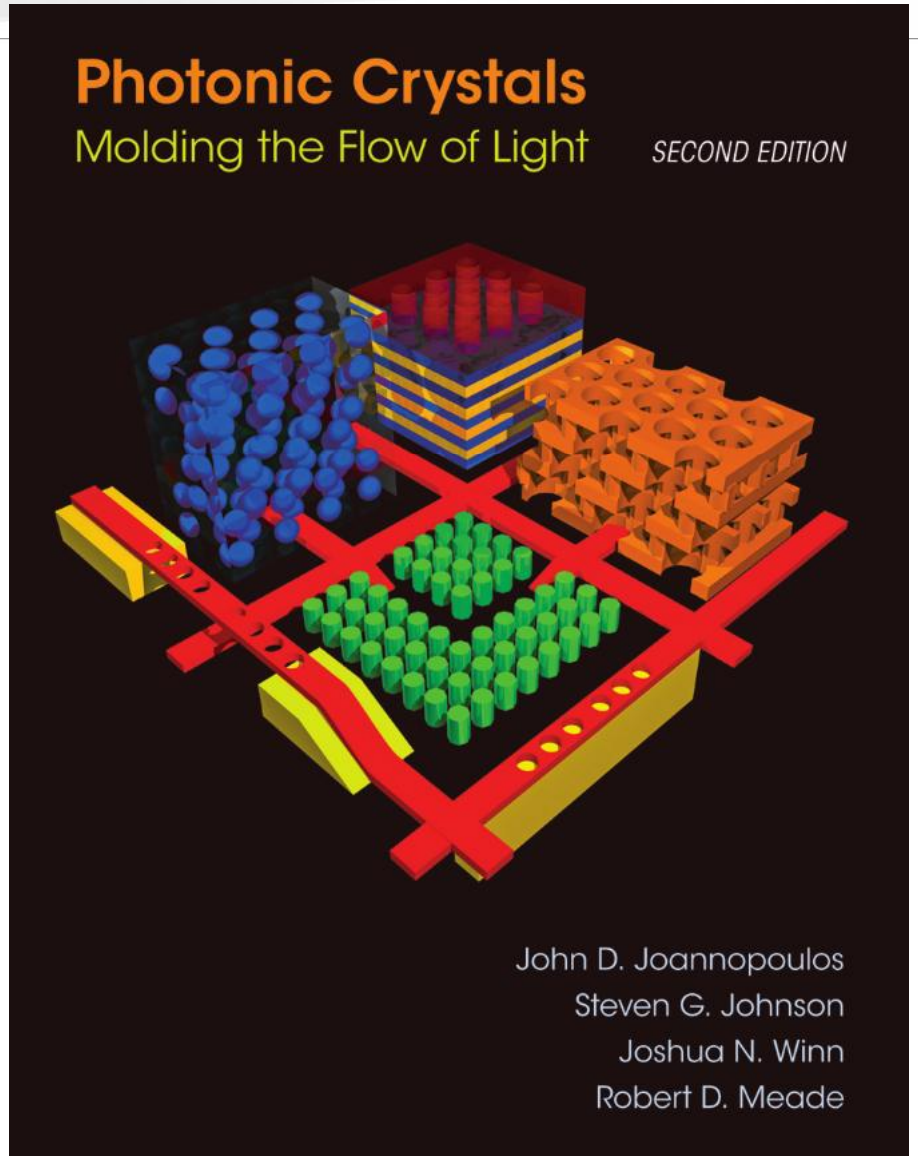
Figure 2: The square lattice. On the left is the network of lattice points in real space. In the middle is the corresponding reciprocal lattice. On the right is the construction of the first Brillouin zone: taking the center point as the origin, we draw the lines connecting the origin to the other lattice points (red), their perpendicular bisectors (blue), and highlight the square boundary of the Brillouin zone (yellow).

$$\mathbf{b}_1 = \frac{2\pi\,\mathbf{a}_2 \times \mathbf{a}_3}{\mathbf{a}_1 \cdot (\mathbf{a}_2 \times \mathbf{a}_3)}, \quad \mathbf{b}_2 = \frac{2\pi\,\mathbf{a}_3 \times \mathbf{a}_1}{\mathbf{a}_1 \cdot (\mathbf{a}_2 \times \mathbf{a}_3)}, \quad \mathbf{b}_3 = \frac{2\pi\,\mathbf{a}_1 \times \mathbf{a}_2}{\mathbf{a}_1 \cdot (\mathbf{a}_2 \times \mathbf{a}_3)}.$$

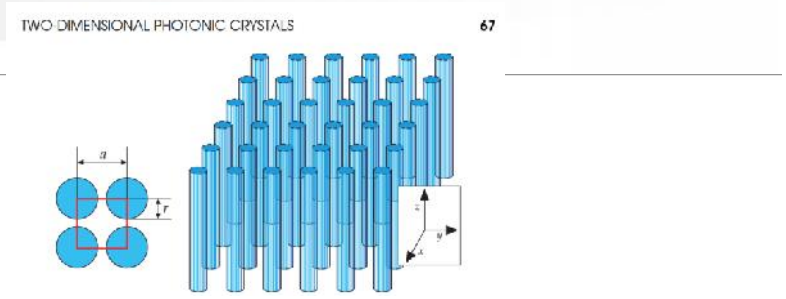
$$\mathbf{G} \cdot \mathbf{R} = (\ell\mathbf{a}_1 + m\mathbf{a}_2 + n\mathbf{a}_3) \cdot (\ell'\mathbf{b}_1 + m'\mathbf{b}_2 + n'\mathbf{b}_3) = 2\pi N.$$

$\mathbf{k} \quad y \quad \mathbf{k} + \mathbf{G}_{\mathbf{n,m}}$ Son el mismo modo

Estudio de cristales fotónicos 2D



Estudio de cristales fotónicos 2D



Settings

Parameters

Parameters

Name	Expression	Value	Description
a	175 [nm]	1.75E-7 m	Lado celda unidad
r	0.2*a	3.5E-8 m	radio cilindros GaAs
k	1	1	fracción del vector de ond...
b	2*pi/a	3.5904E7 1/m	Lado celda unidad red reci...
kx	k*b	3.5904E7 1/m	vector de bloch, compone...
ky	k*b	3.5904E7 1/m	vector de bloch, compone...

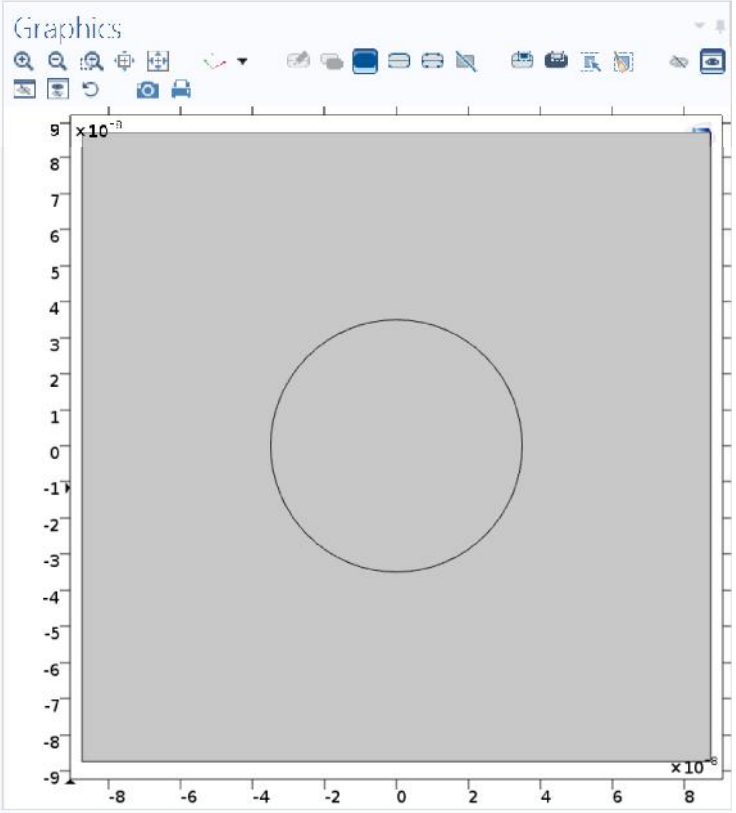
Name:

ky

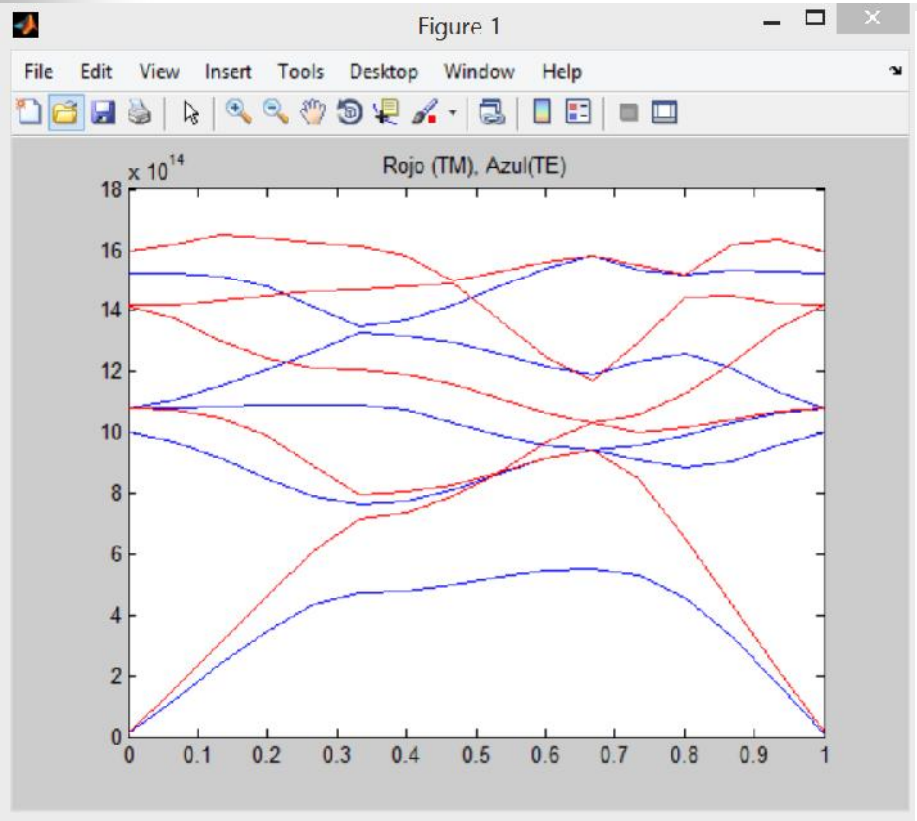
Expression:

k*b

Graphics



Estudio de cristales fotónicos 2D



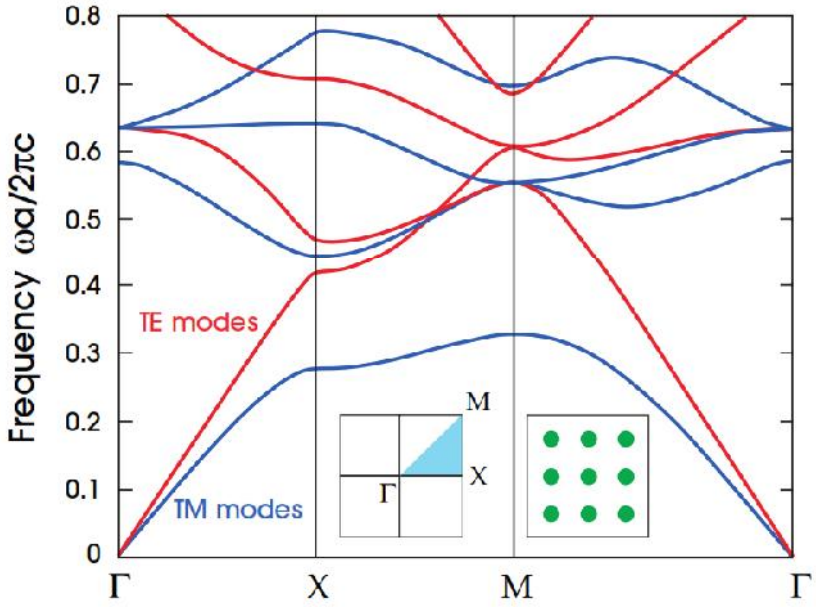


Figure 2: The photonic band structure for a square array of dielectric columns with $r = 0.2a$. The blue bands represent TM modes and the red bands represent TE modes. The left inset shows the Brillouin zone, with the irreducible zone shaded light blue. The right inset shows a cross-sectional view of the dielectric function. The columns ($\varepsilon = 8.9$, as for alumina) are embedded in air ($\varepsilon = 1$).

Estudio de cristales fotónicos 2D

Settings

Parameters

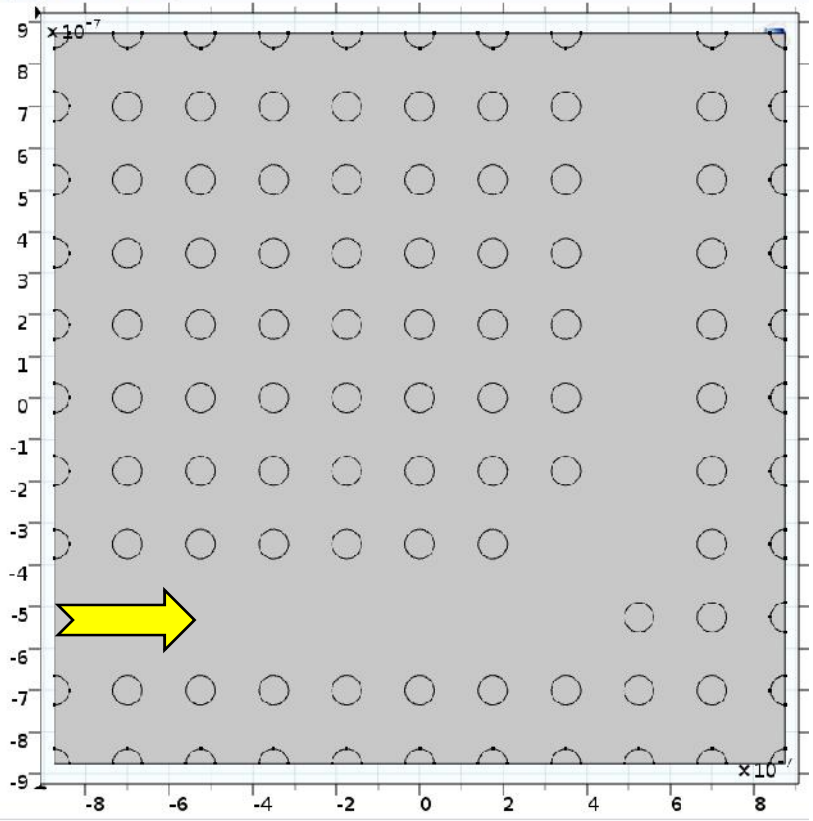
Parameters

Name	Expression	Value	Description
a	175 [nm]	1.75E-7 m	
b	0.2*a	3.5E-8 m	

Name:

Expression:

Graphics



Estudio de cristales fotónicos 2D

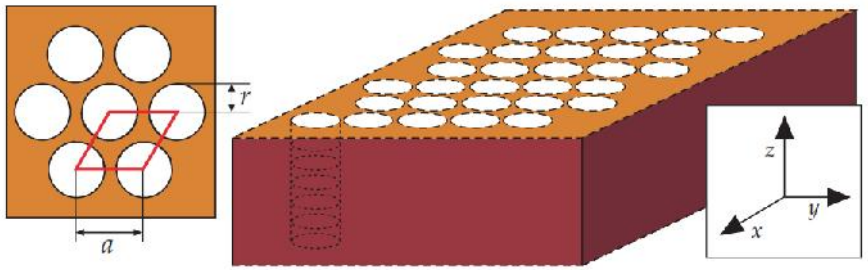


Figure 8: A two-dimensional photonic crystal of air columns in a dielectric substrate (which we imagine to extend indefinitely in the z direction). The columns have radius r and dielectric constant $\varepsilon = 1$. The left inset shows a view of the triangular lattice from above, with the unit cell framed in red. It has lattice constant a.

Settings

Parameters

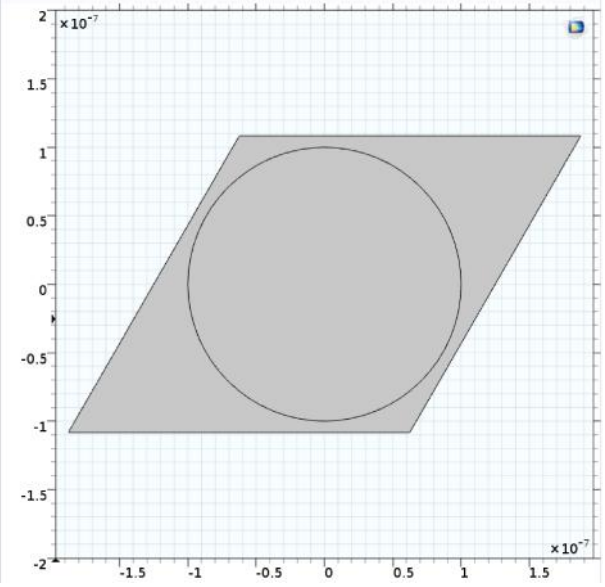
Parameters

Name	Expression	Value	Description
a	250 [nm]	2.5E-7 m	Lado celda unidad
r	0.4*a	1E-7 m	radio cilindros GaAs
k	0.01	0.01	fracción del vector de ond...
b	2*pi/a	2.5133E7 1/m	Lado celda unidad red reci...
kx	k*b	2.5133E5 1/m	vector de bloch, compone...
ky	k*b	2.5133E5 1/m	vector de bloch, compone...

Name:

Expression:

Graphics



Estudio de cristales fotónicos 2D

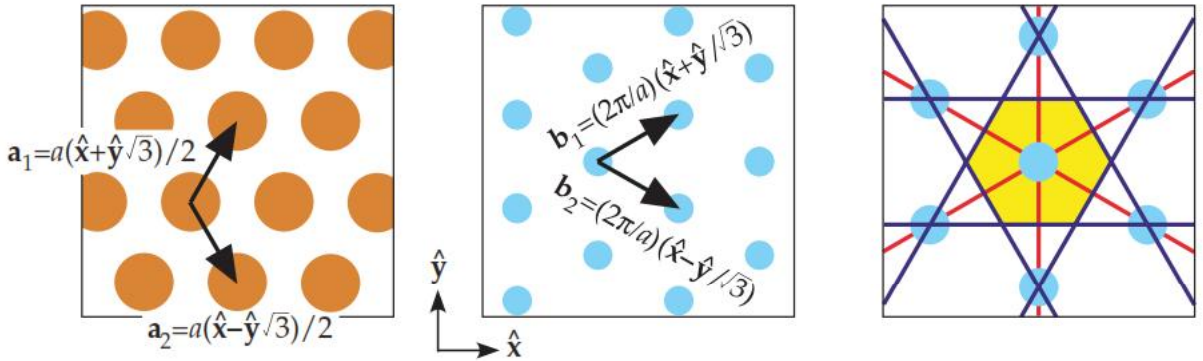


Figure 3: The triangular lattice. On the left is the network of lattice points in real space. In the middle is the corresponding reciprocal lattice, which in this case is a rotated version of the original. On the right is the Brillouin zone construction. In this case, the first Brillouin zone is a hexagon centered around the origin.

Estudio de cristales fotónicos 2D

Settings

Parameters

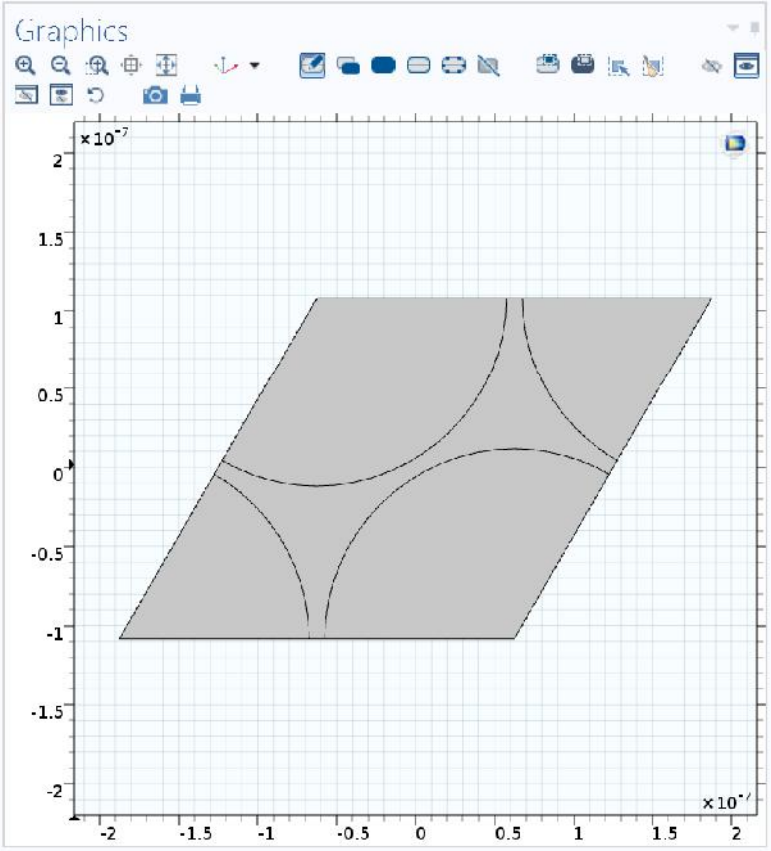
Parameters

Name	Expression	Value	Description
a	250 [nm]	2.5E-7 m	Lado celda unidad
r	0.48*a	1.2E-7 m	radio cilindros GaAs
k	0.01	0.01	fracción del vector de ond...
b	2*pi/a	2.5133E7 1/m	Lado celda unidad red reci...
kx	k*b	2.5133E5 1/m	vector de bloch, compone...
ky	k*b	2.5133E5 1/m	vector de bloch, compone...
lmb	500 [nm]	5E-7 m	
f0	c_const/lmb	5.9958E14 1/s	

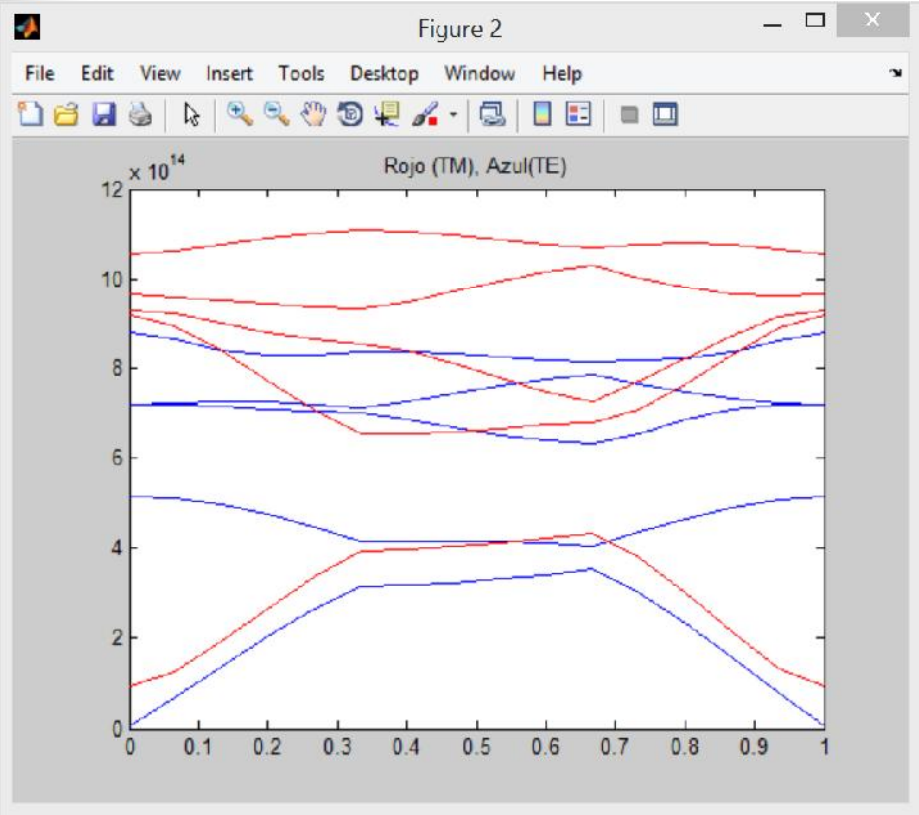
Name:

Expression:

Graphics



Estudio de cristales fotónicos 2D



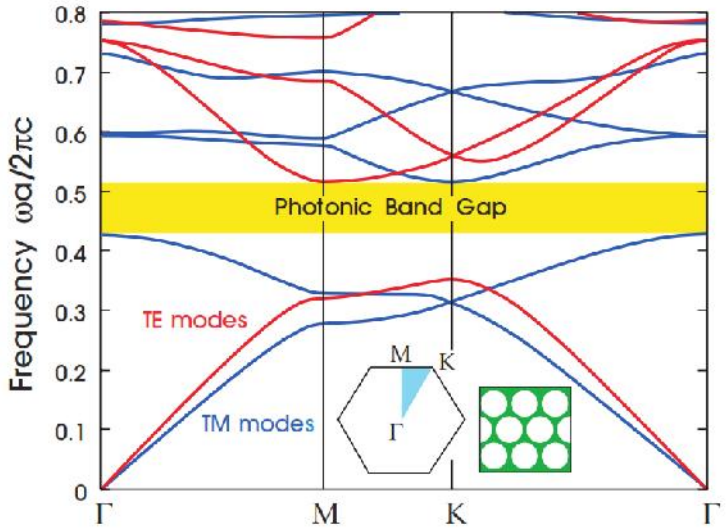


Figure 10: The photonic band structure for the modes of a triangular array of air columns drilled in a dielectric substrate ($\varepsilon = 13$). The blue lines represent TM bands and the red lines represent TE bands. The inset shows the high-symmetry points at the corners of the irreducible Brillouin zone (shaded light blue). Note the complete photonic band gap.

Estudio de cristales fotónicos 2D: Fibras de cristal fotónico

NKT Photonics
the power of light

Crystal Fibre • *aero*LASE • Koheras • SuperK

LMA-5

Single mode 5µm core fiber

- Low fiber loss from 400 nm to 1700 nm
- Single-mode at all wavelengths
- Radiation hard pure silica fiber
- Wavelength independent MFD

Single Mode · Large Mode-area

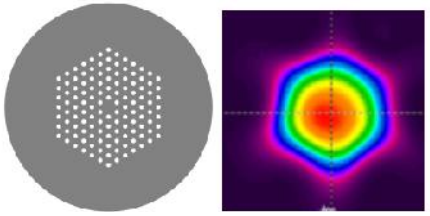
This single-mode photonic crystal fiber is optimized to exhibit low loss across the widest possible wavelength region from 400 nm to above 1700 nm while keeping an almost constant mode field diameter.

The fiber is endlessly single-mode with no higher order mode cut-off and delivers excellent mode quality at all wavelengths.

The fiber has a standard 125 µm outer diameter and is compatible with all common fiber tools.

This product is also available in a polarization-maintaining version as the LMA-PM-5.

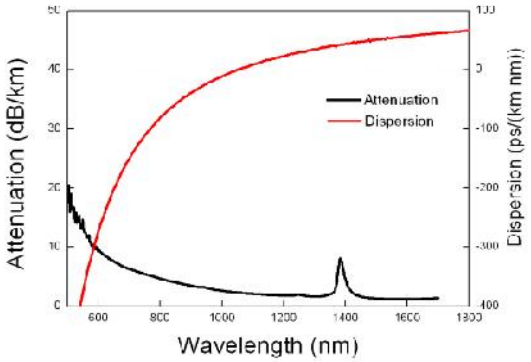
Optical properties	
Single mode cut-off wavelength*	None
Attenuation @ 532 nm**	< 20 dB/km
Attenuation @ 632 nm	< 10 dB/km
Attenuation @ 1064 nm	< 5 dB/km
Mode field diameter @ 532 nm (1/e²)	4.5 ± 0.5 µm
Mode field diameter @ 1064 nm (1/e²)	4.7 ± 0.5 µm
NA @ 1064 nm (5%)	0.20 ± 0.02
Physical properties	
Core diameter	5.0 ± 0.5 µm
Outer cladding diameter, OD	125 ± 2 µm
Coating diameter	245 ± 10 µm
Core and cladding material	Pure silica
Coating material, single layer	Acrylate



Applications

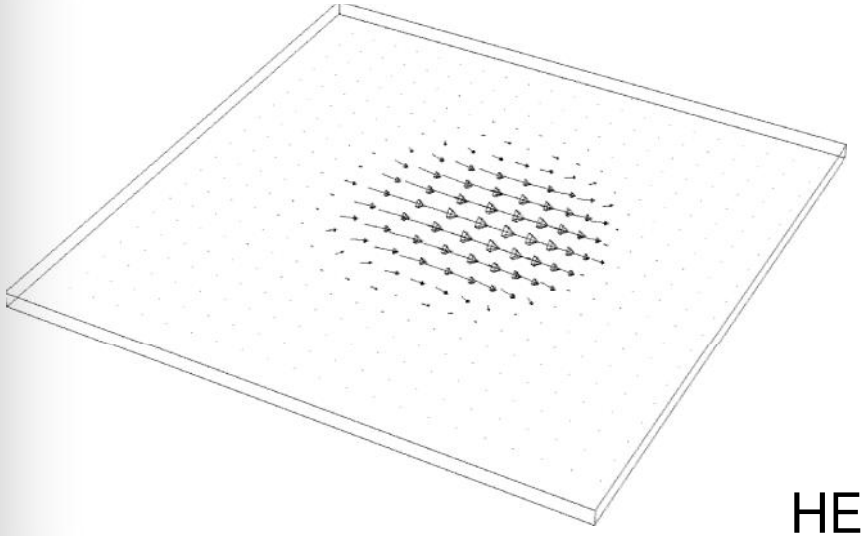
- Single-mode high power delivery
- Mode filtering
- Single-mode pigtailing
- Short pulse delivery

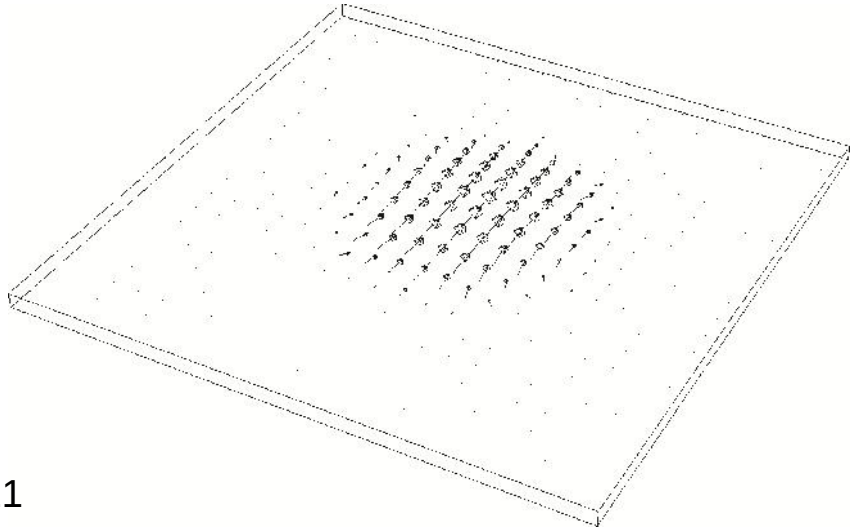
Typical spectral attenuation and dispersion



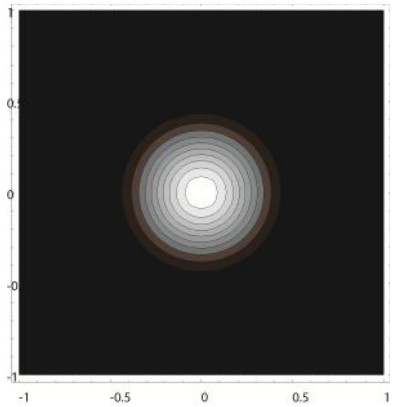
Typical MFD and NA

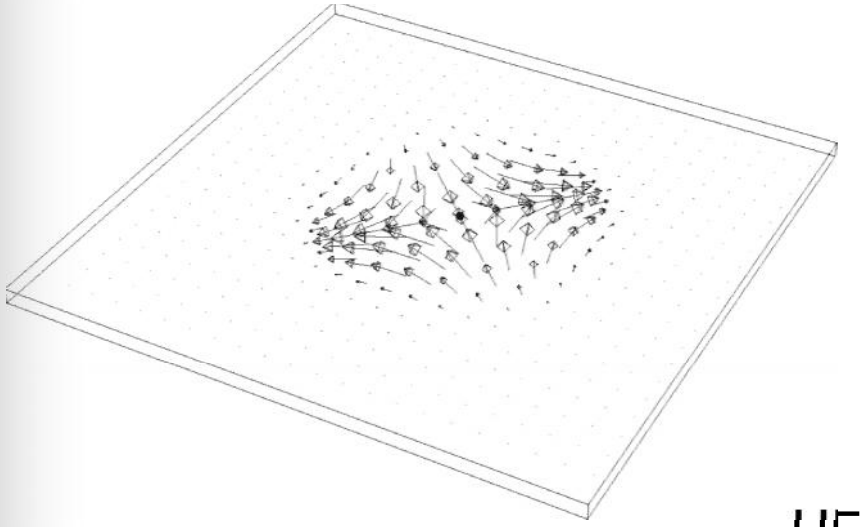
Modos en un fibra de salto de índice

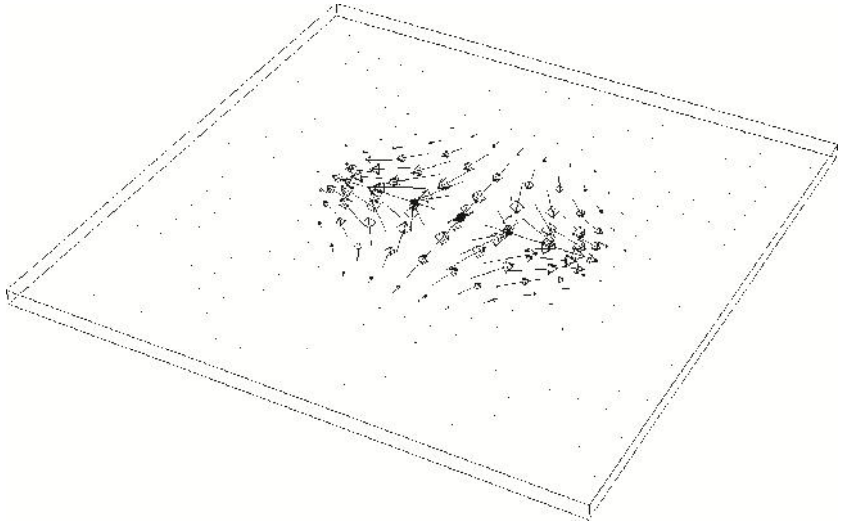




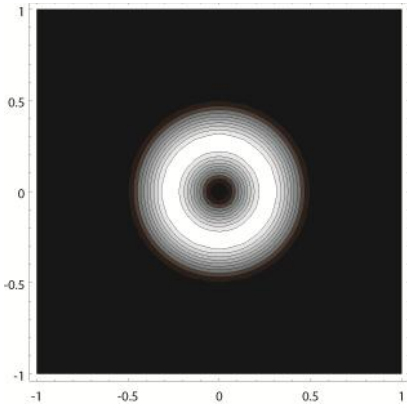
HE_{11}

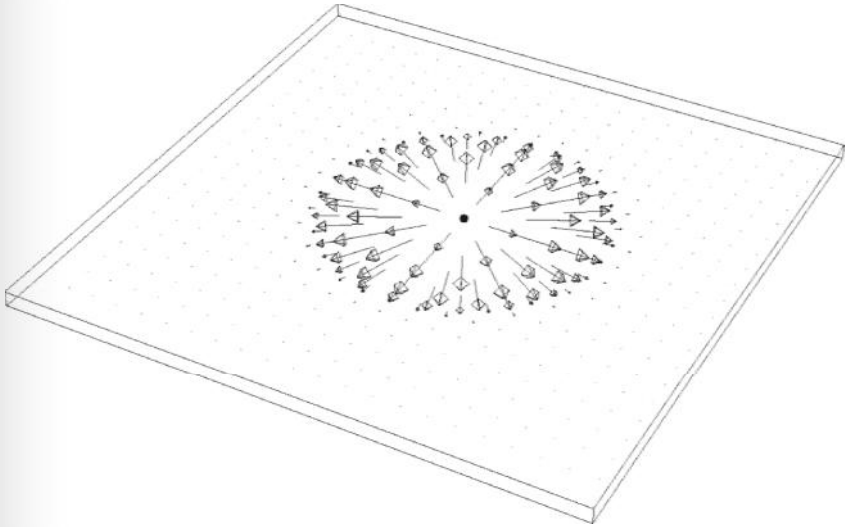




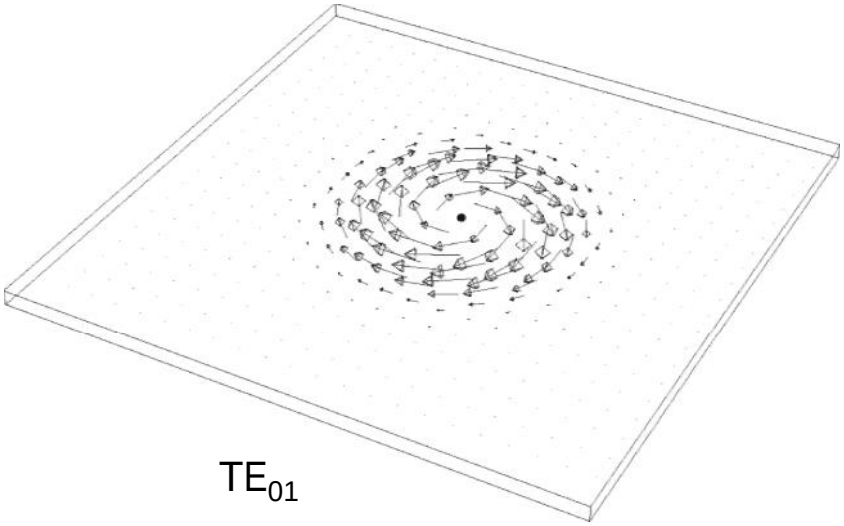


HE_{21}





TM_{01}



TE_{01}