# Proyecto Conjunto MATLAB/MATHEMATICA

## Sistema láser bombeado ópticamente con dependencia espacial

Realizado por Isabel Rodríguez y Javier Gil

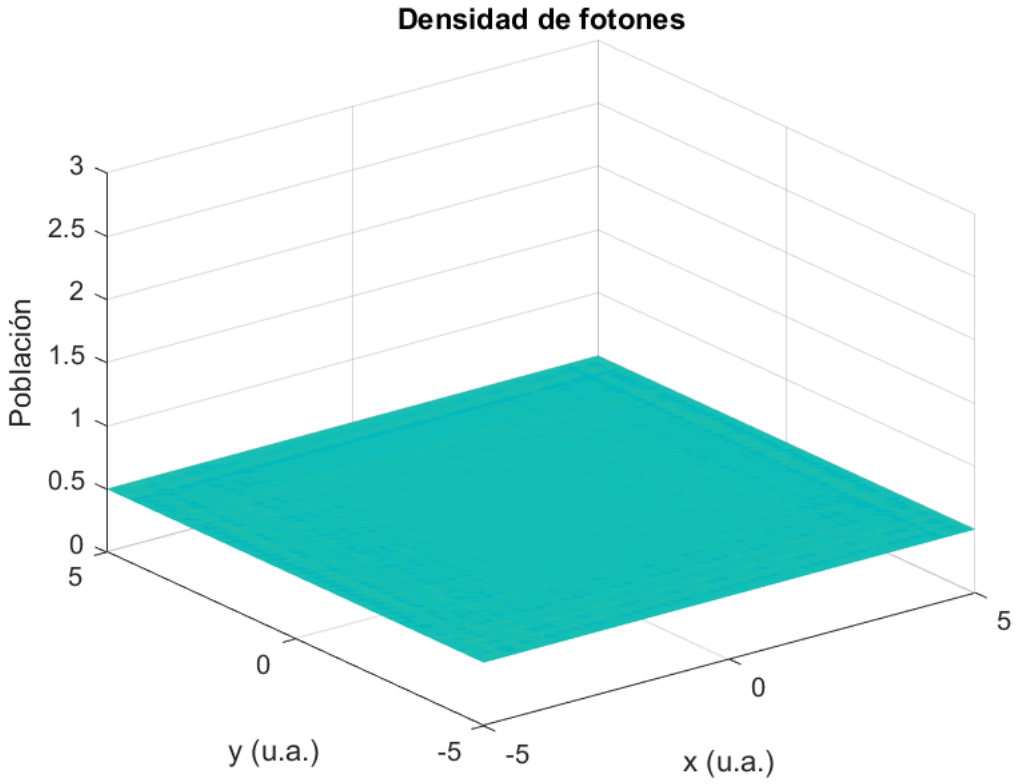
```
rect=[0, 0, 520, 410]; %%Tamaño del frame de los videos
%%Vector de la forma: [left bottom width height]

%_______________________________VIDEO_DENSIDAD_DE_FOTONES_____________________________
bi=1; %%Frame inicial
bf=10; %%Frame final
ndz=(bf-bi) %%Número de frames
```

```
ndz = 9
```

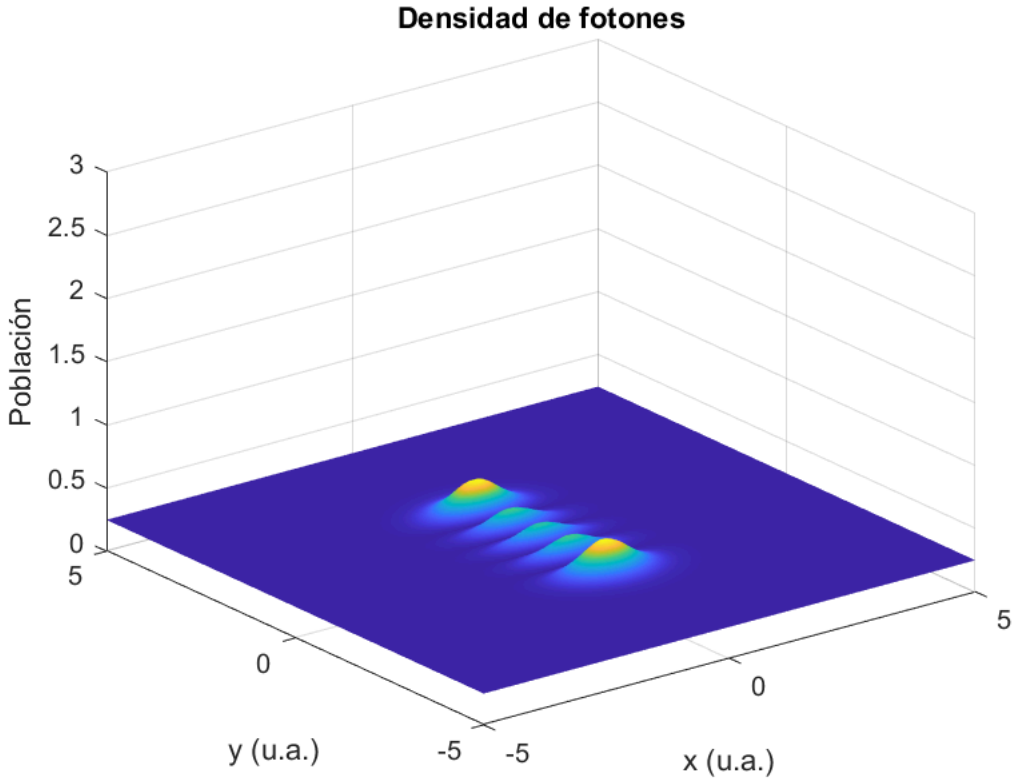
```
Densidad(ndz)=struct('cdata',[],'colormap',[]); %%Array que guarda cada captura
for j=bi:bf %%Bucle de frames
    %%FICHEROS QUE IMPORTAMOS DE MATHEMATICA
    %%Importamos el frame con el mismo num que el indice j
    nomFile=sprintf('frame%d.dat',j)
    %%Especificamos la separación entre una columna y otra
    Esp=importdata(nomFile,' ');
    x=Esp(:,1); %%primera columna son las x
    y=Esp(:,2); %%segunda comlumna las y
    z=Esp(:,3); %%densidad de fotones

    %%Hacemos un mallado para representar la densidad de fotones en 3D
    xlin=linspace(min(x),max(x),90); %%90 medidas desde el valor mínimo al máximo
    ylin=linspace(min(y),max(y),90);
    [X,Y]=meshgrid(xlin,ylin);
    Z=griddata(x,y,z,X,Y,'cubic');



    figure %%La representación de cada frame se representa como una figura
    surf(X,Y,Z)
    shading interp %%Diseño para que quede bonito
    title('Densidad de fotones', 'FontSize', 16, 'FontName', 'Helvetica');
    xlabel(' x (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    ylabel(' y (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    zlabel('Población', 'FontSize', 12, 'FontName', 'Helvetica');
    set(gca, 'FontSize', 10, 'FontName', 'Helvetica');
    zlim([0,3])

    %%La representación se guarda como una imagen jpg
    filename=sprintf('densidad%d.jpg',j)
    Densidad(j) = getframe(gcf,rect);
    %%gcf: Captura el interior de la figure window excluyendo la barra de
    %%menu y de herramientas

    %%rect: Se captura los pixeles especificados en rect

    j
```

```
end
```

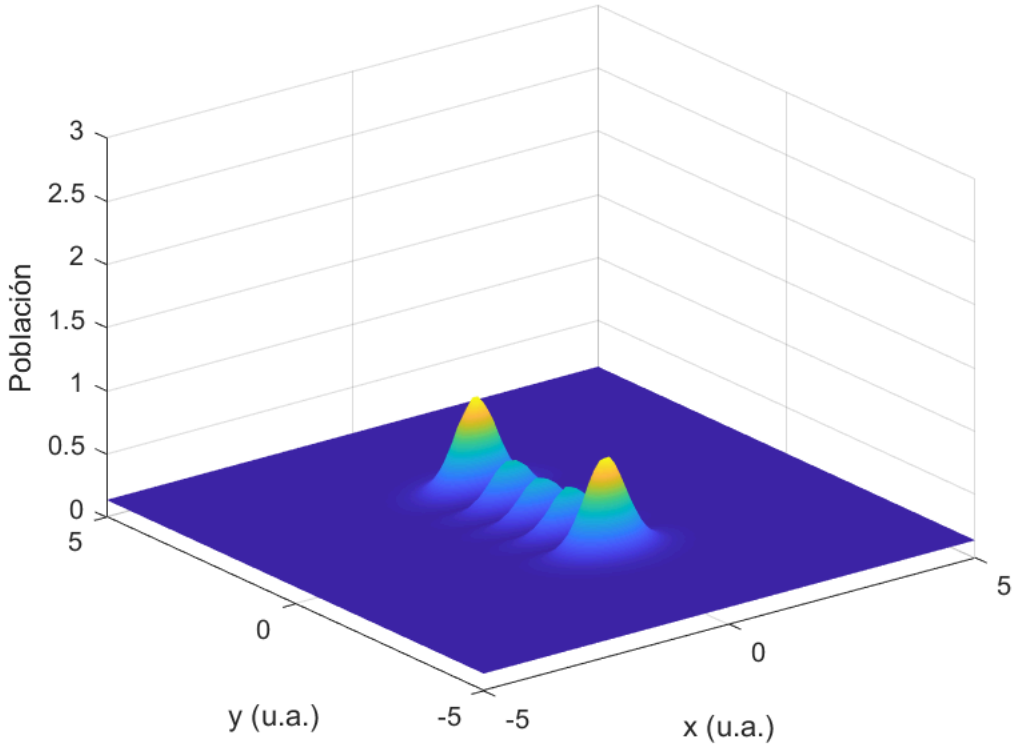
```
nomFile =
'frame1.dat'
filename =
'densidad1.jpg'
```




```
j = 1
nomFile =
'frame2.dat'
filename =
'densidad2.jpg'
```

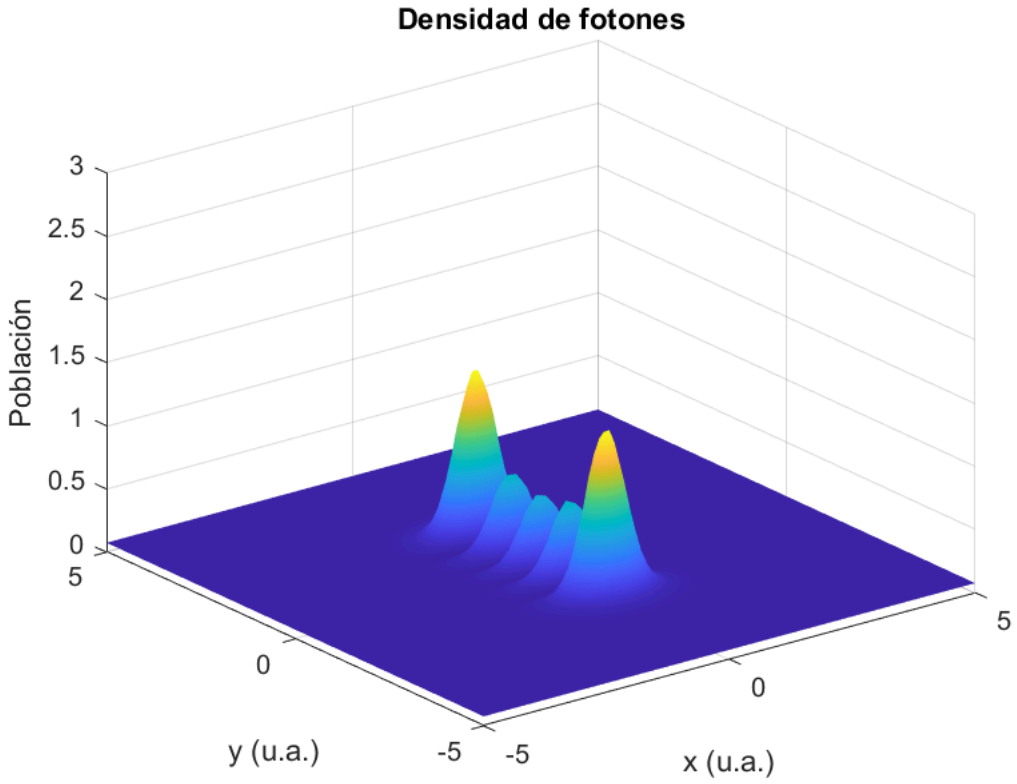



```
j = 2
nomFile =
'frame3.dat'
filename =
'densidad3.jpg'
```

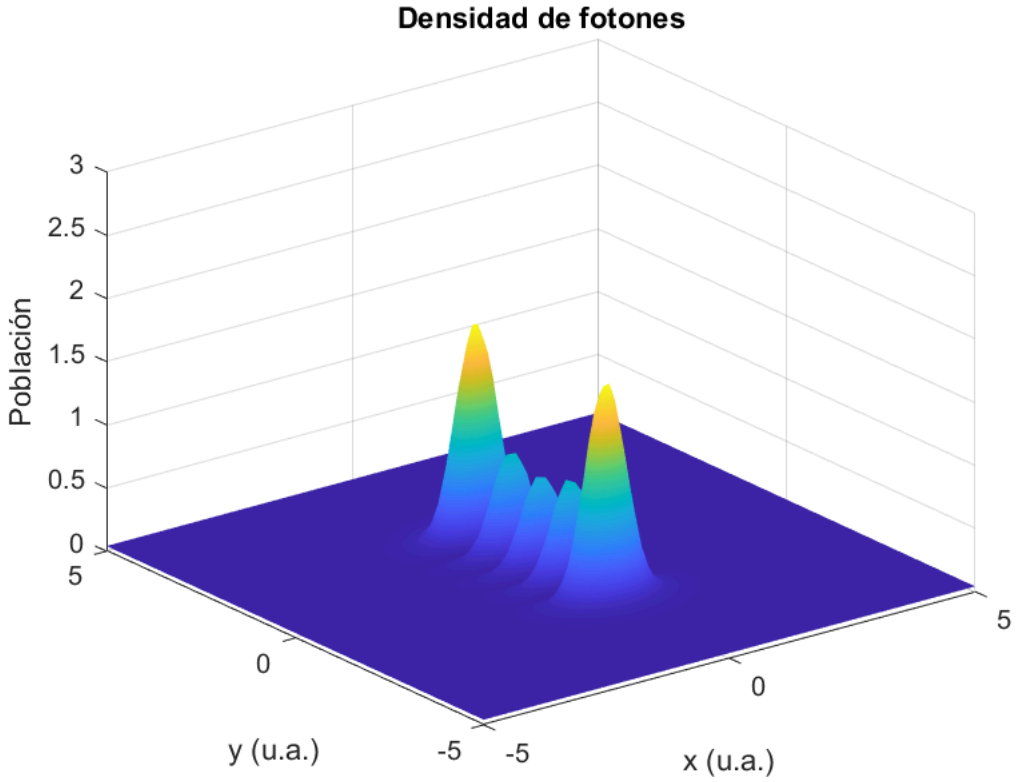



```
j = 3
```

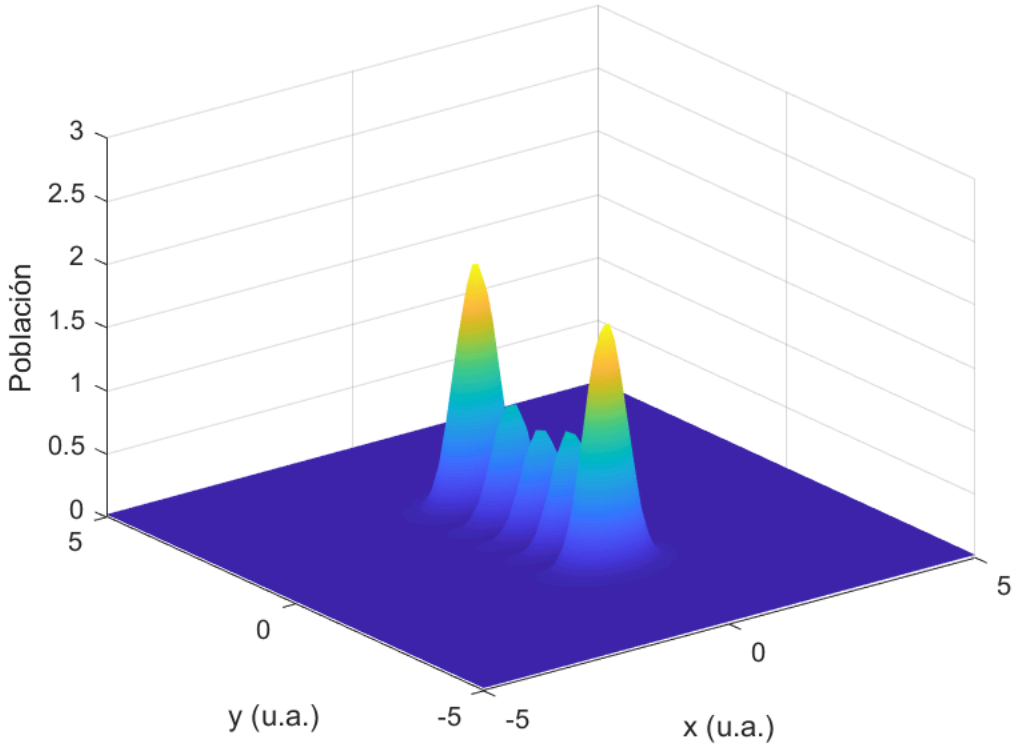
```
nomFile =
'frame4.dat'
filename =
'densidad4.jpg'
```




```
j = 4
nomFile =
'frame5.dat'
filename =
'densidad5.jpg'
```

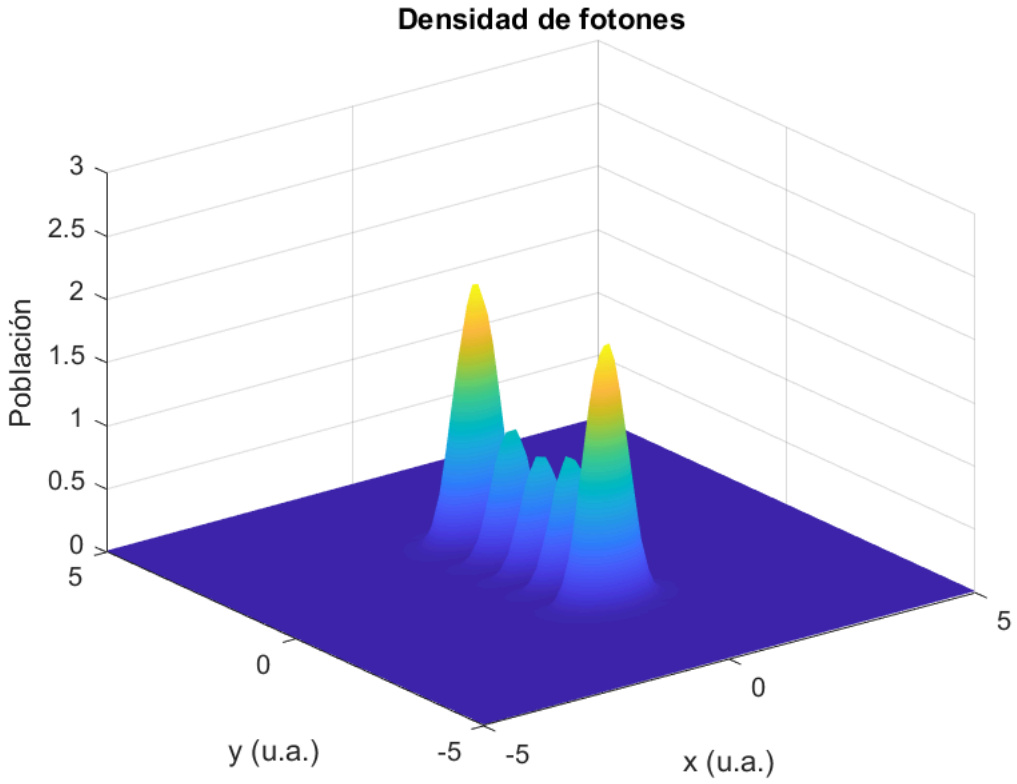



```
j = 5
nomFile =
'frame6.dat'
filename =
'densidad6.jpg'
```

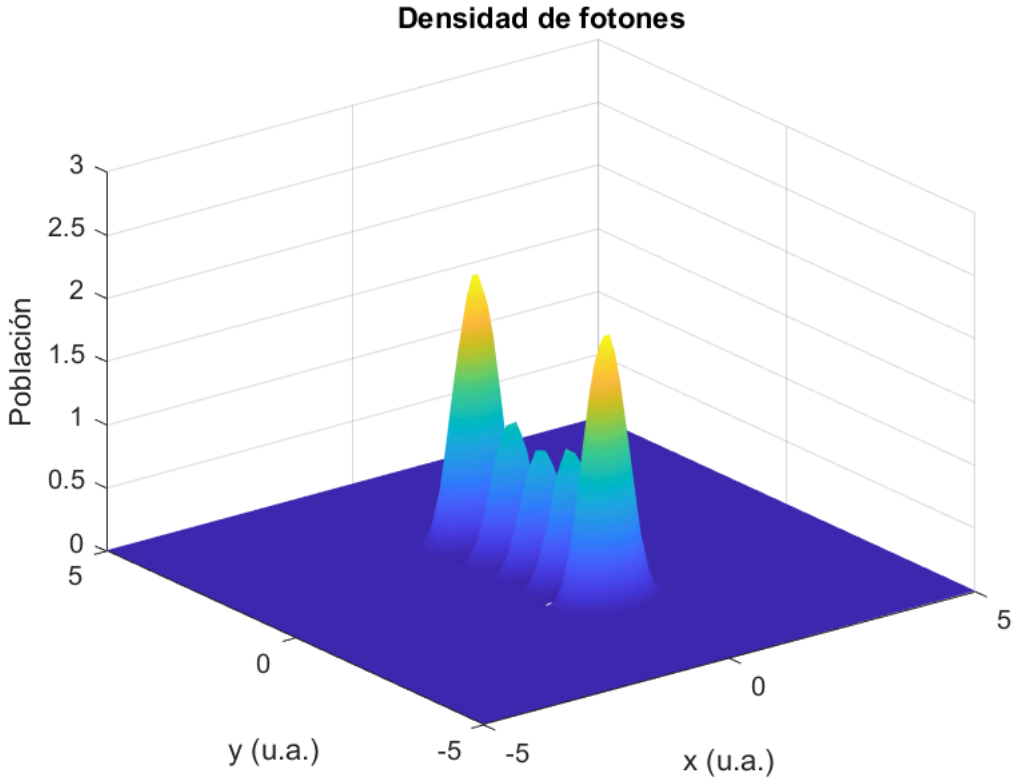



```
j = 6
```

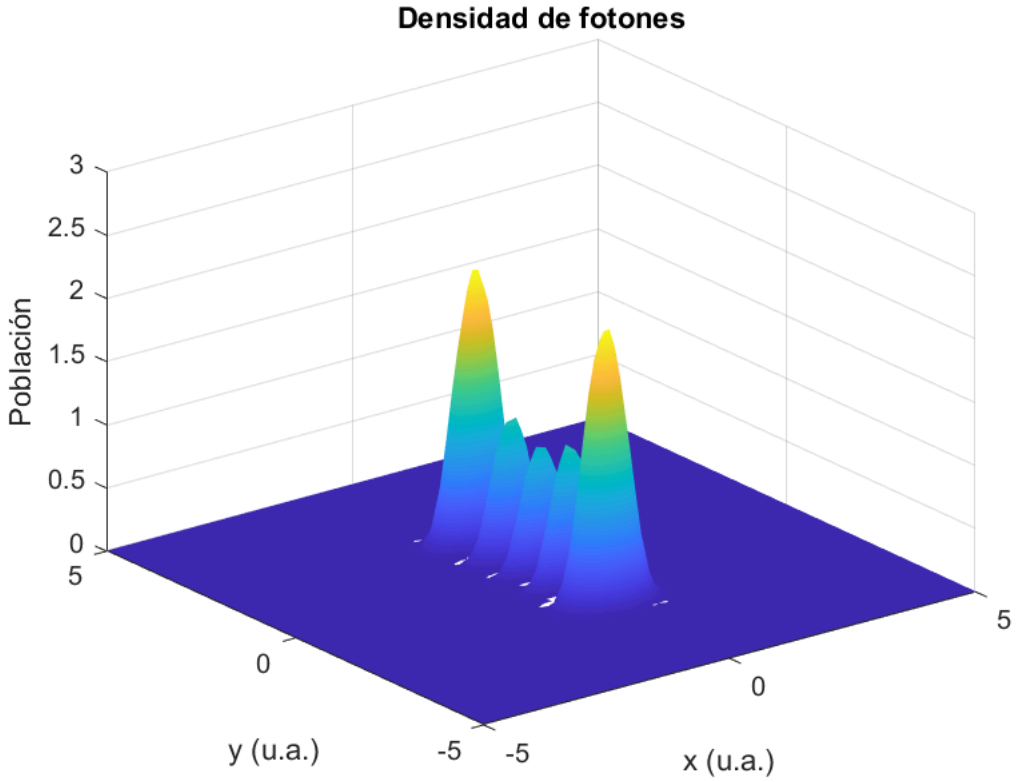
```
nomFile =
'frame7.dat'
filename =
'densidad7.jpg'
```




```
j = 7
nomFile =
'frame8.dat'
filename =
'densidad8.jpg'
```

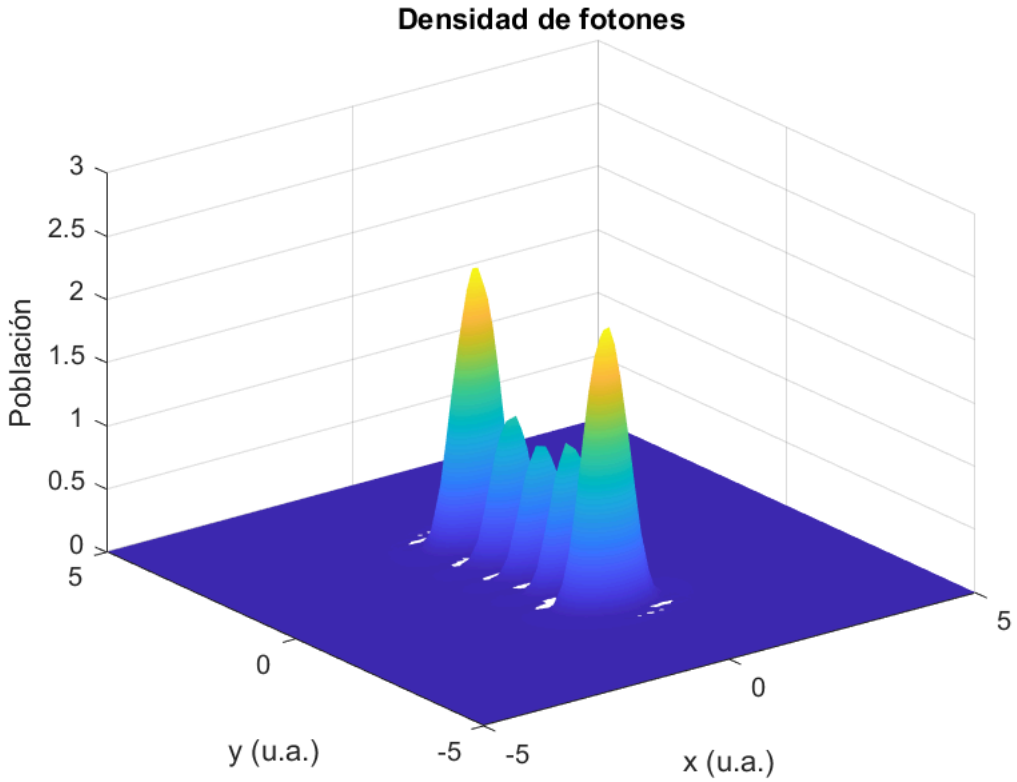



```
j = 8
nomFile =
'frame9.dat'
filename =
'densidad9.jpg'
```




```
j = 9
```

```
nomFile =
'frame10.dat'
filename =
'densidad10.jpg'
```




```
j = 10
```

```
%%Creación del video
v = VideoWriter('Densidaddefotones.avi','Motion JPEG AVI');
%%Creamos el archivo de video en el formato y nombre especificado
v.FrameRate=5;
v.Quality=100;
open(v); %%Abrimos el video
writeVideo(v,Densidad);
%%Escribe la matriz de datos Densidad en el archivo de video v
close(v); %%Cerramos el video

%_____________________________VIDEO_POBLACIÓN_NIVEL_1_____________________________
%%Análogo al caso anterior
ci=1
```

```
ci = 1
```

```
cf=16
```

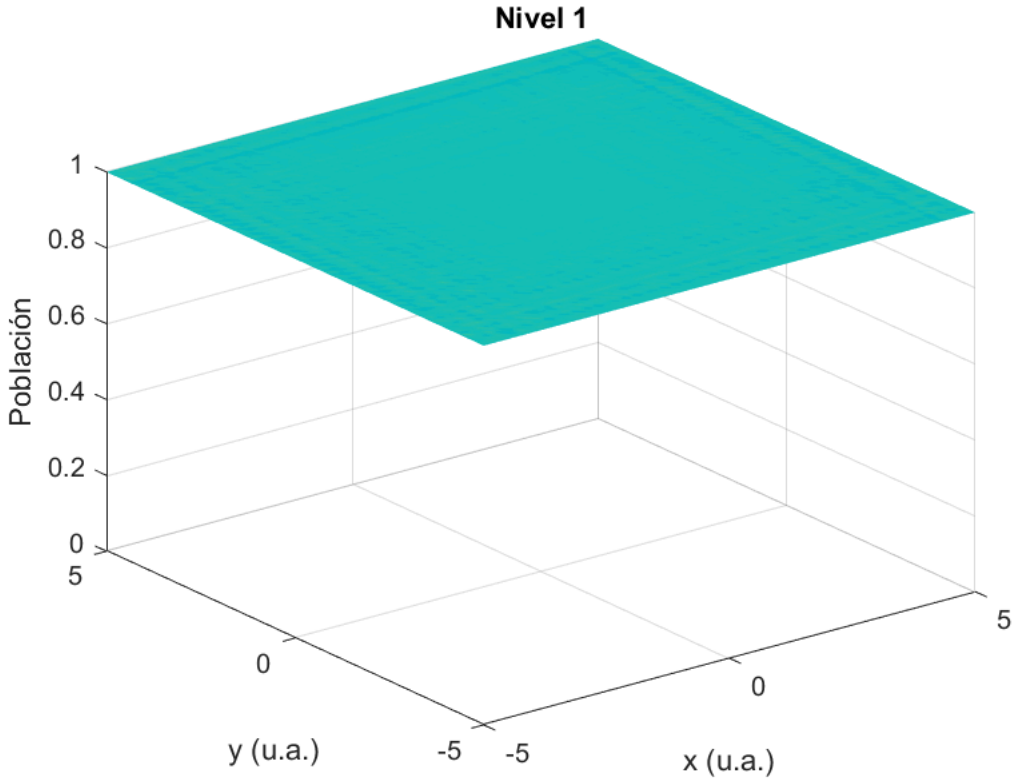
```
cf = 16
```

```
ndz1=cf-ci
```

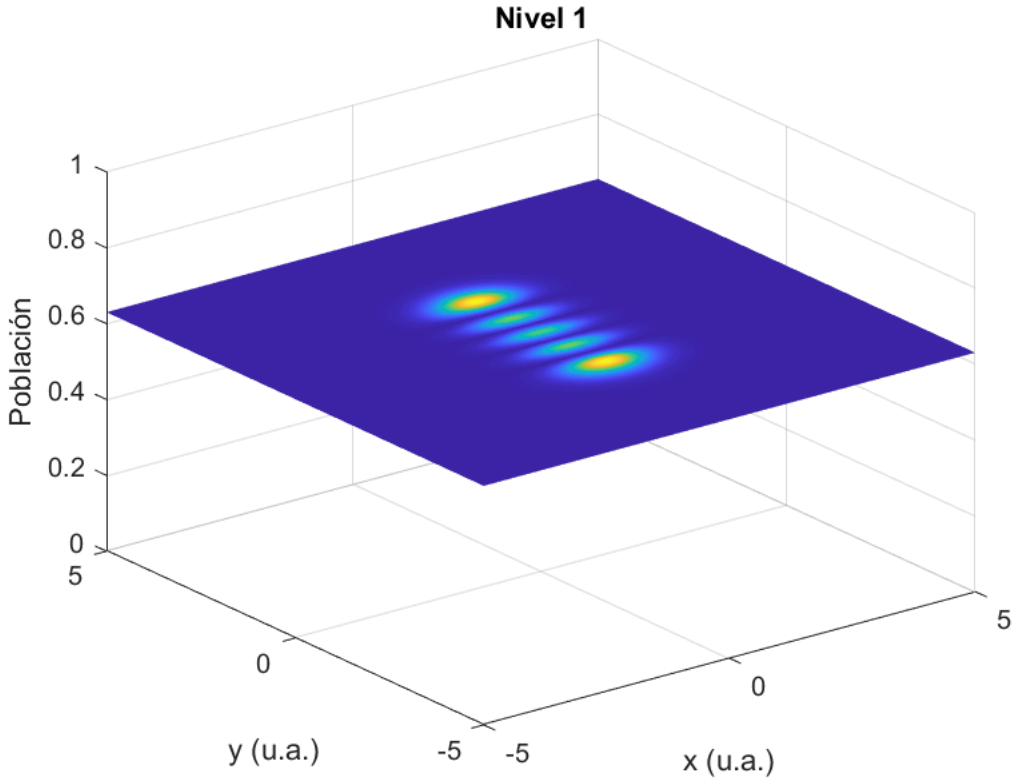
```
ndz1 = 15
```

```
nivel1(ndz1)=struct('cdata',[],'colormap',[]);
for j=ci:cf
    nomFile=sprintf('nivel1%d.dat',j)
    Esp=importdata(nomFile,' ');
    x=Esp(:,1);
    y=Esp(:,2);
    z=Esp(:,3)

    xlin=linspace(min(x),max(x),90);
    ylin=linspace(min(y),max(y),90);
    [X,Y]=meshgrid(xlin,ylin);
    Z=griddata(x,y,z,X,Y,'cubic');



    figure
    surf(X,Y,Z)
    shading interp
    title('Nivel 1', 'FontSize', 16, 'FontName', 'Helvetica');
    xlabel(' x (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    ylabel(' y (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    zlabel('Población', 'FontSize', 12, 'FontName', 'Helvetica');
    set(gca, 'FontSize', 10, 'FontName', 'Helvetica');
    zlim([0,1])


    filename=sprintf('nivel1%d.jpg',j)
    nivel1(j) = getframe(gcf,rect);

    j
end
```

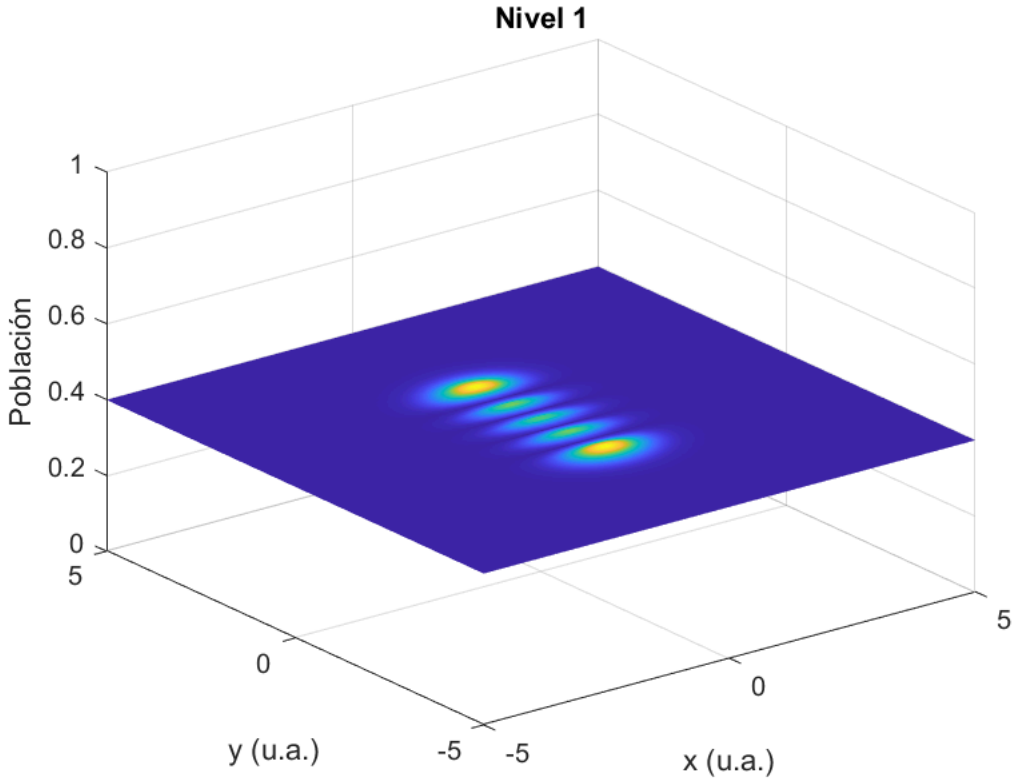
```
nomFile =
'nivel11.dat'
z = 2601×1
     1
     1
     1
     1
     1
     1
     1
     1
     1
     1
     ⋮
filename =
'nivel11.jpg'
```



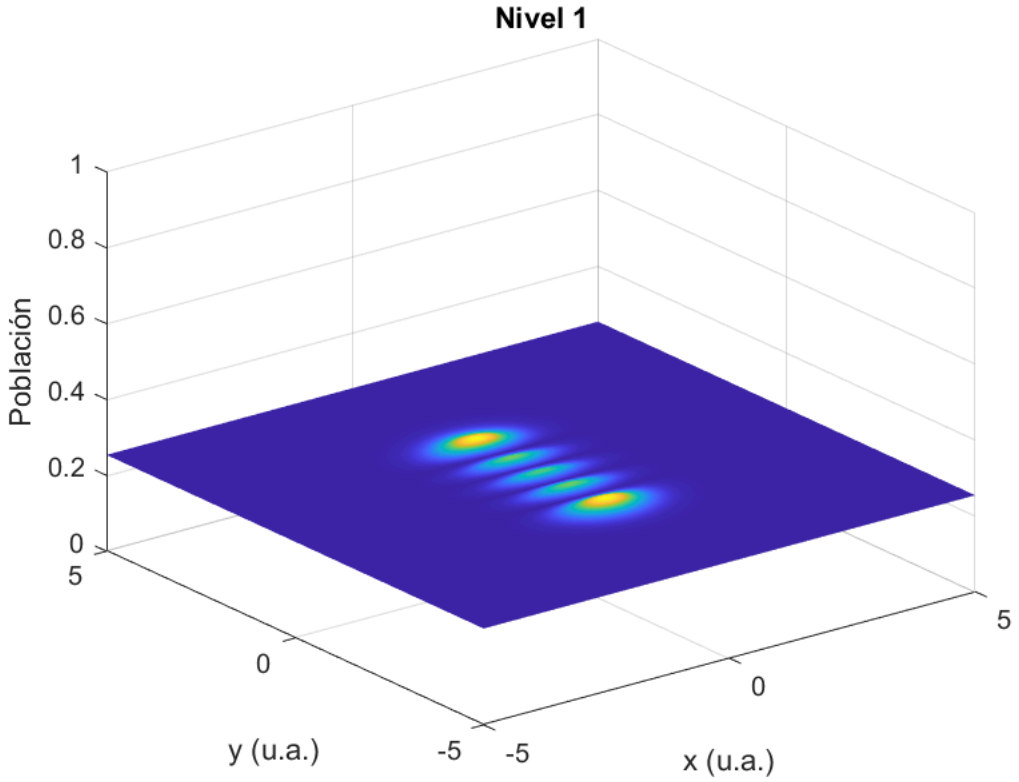

```
j = 1
nomFile =
'nivel12.dat'
z = 2601×1
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
    0.6302
     ⋮
filename =
'nivel12.jpg'
```



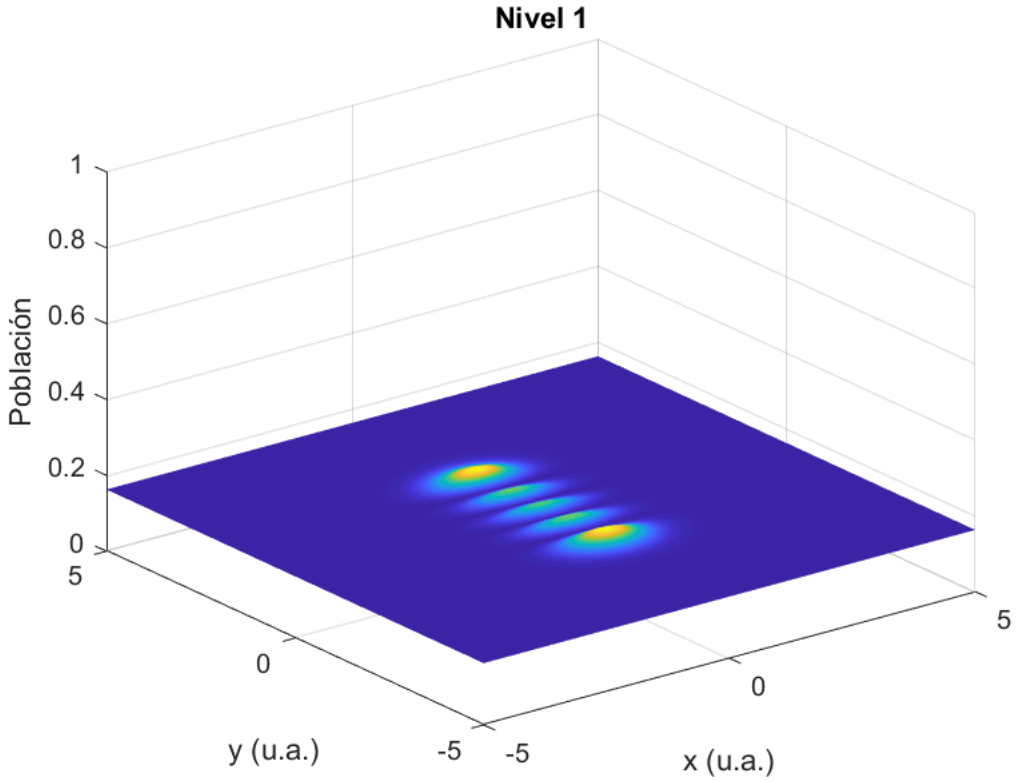

```
j = 2
nomFile =
'nivel13.dat'
z = 2601×1
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
    0.3990
      ⋮
filename =
'nivel13.jpg'
```



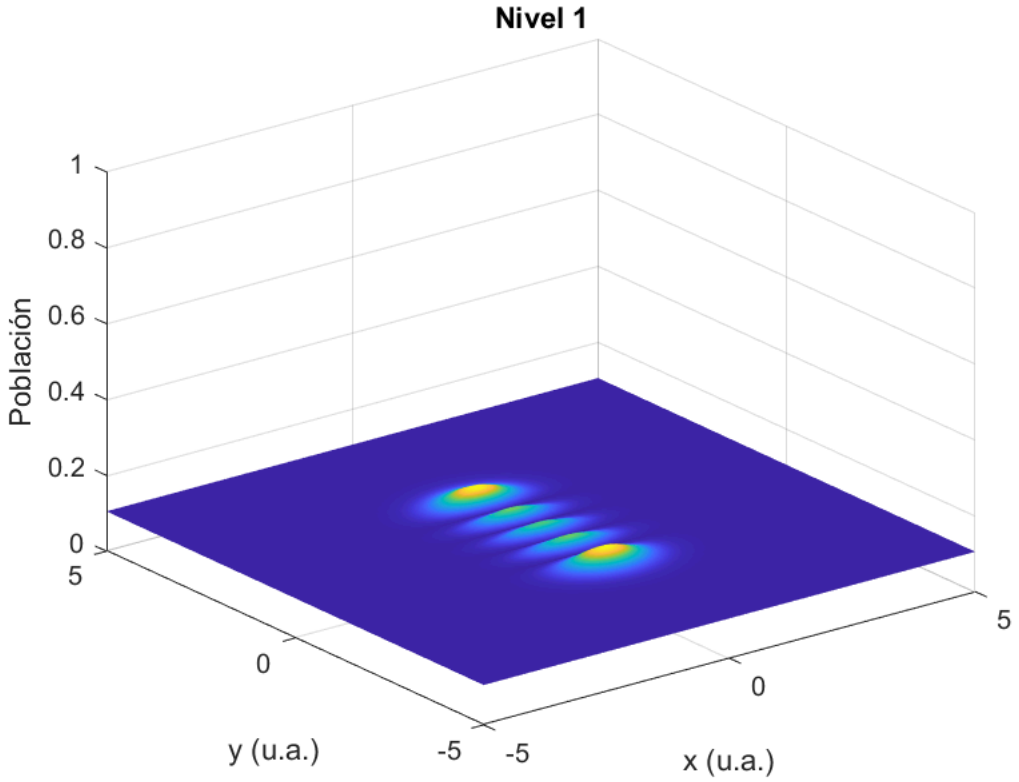

```
j = 3
nomFile =
'nivel14.dat'
z = 2601×1
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
    0.2540
      ⋮
filename =
'nivel14.jpg'
```



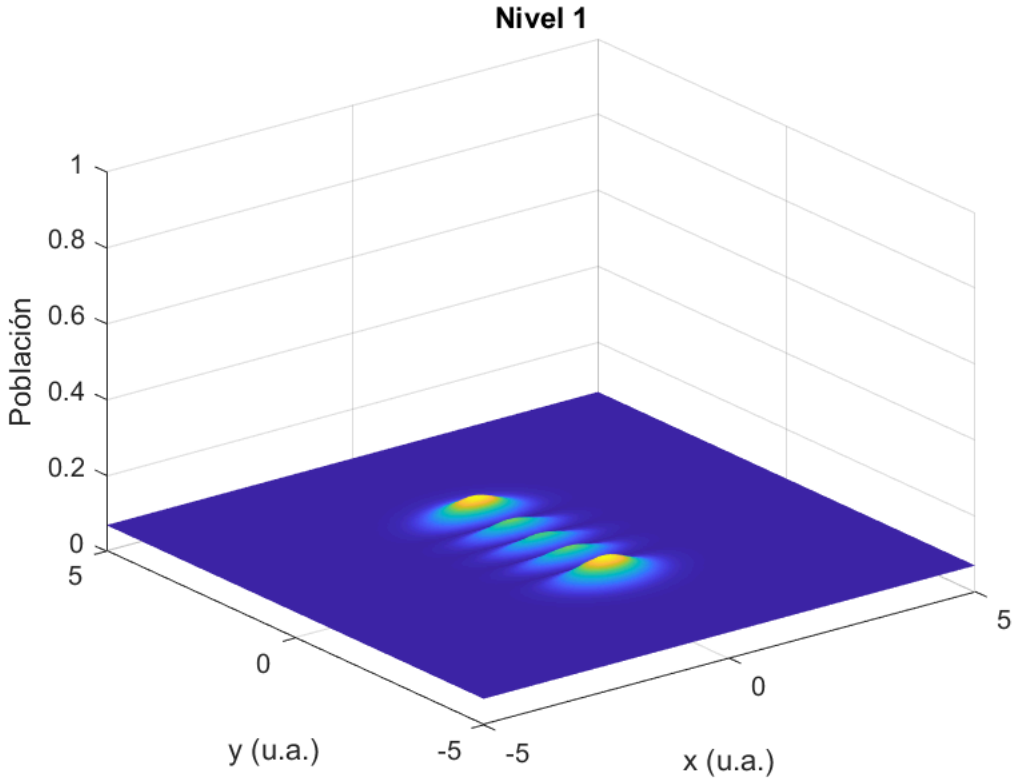

```
j = 4
nomFile =
'nivel15.dat'
z = 2601×1
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
    0.1627
     ⋮
filename =
'nivel15.jpg'
```



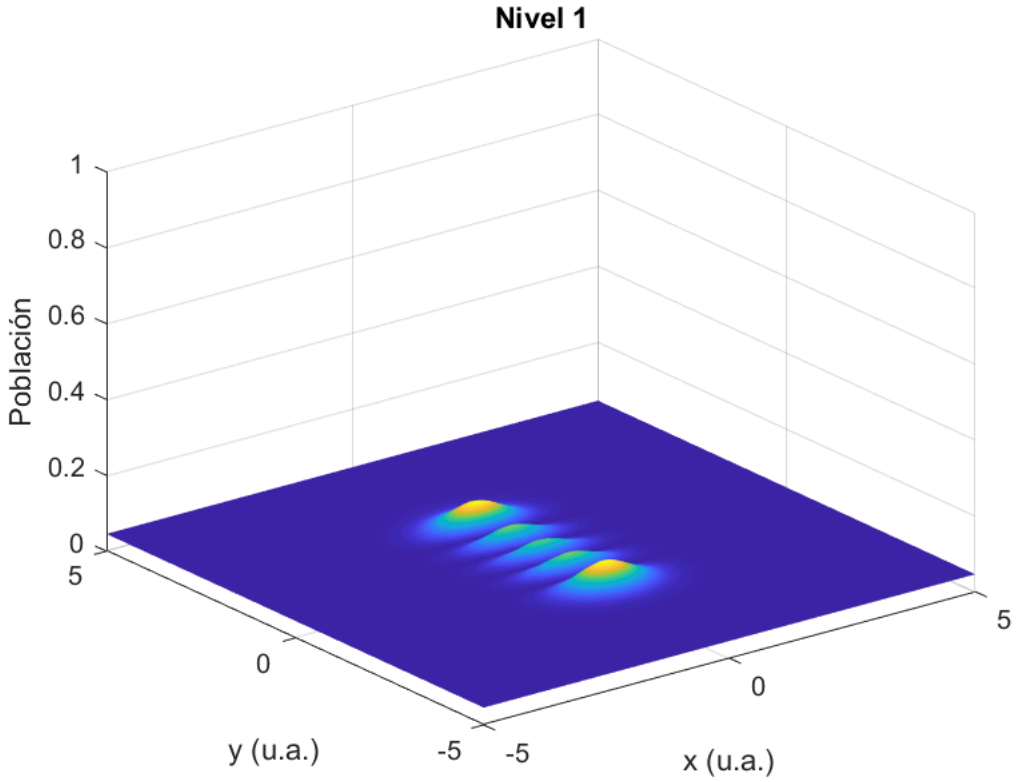

```
j = 5
nomFile =
'nivel16.dat'
z = 2601×1
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
    0.1051
     ⋮
filename =
'nivel16.jpg'
```



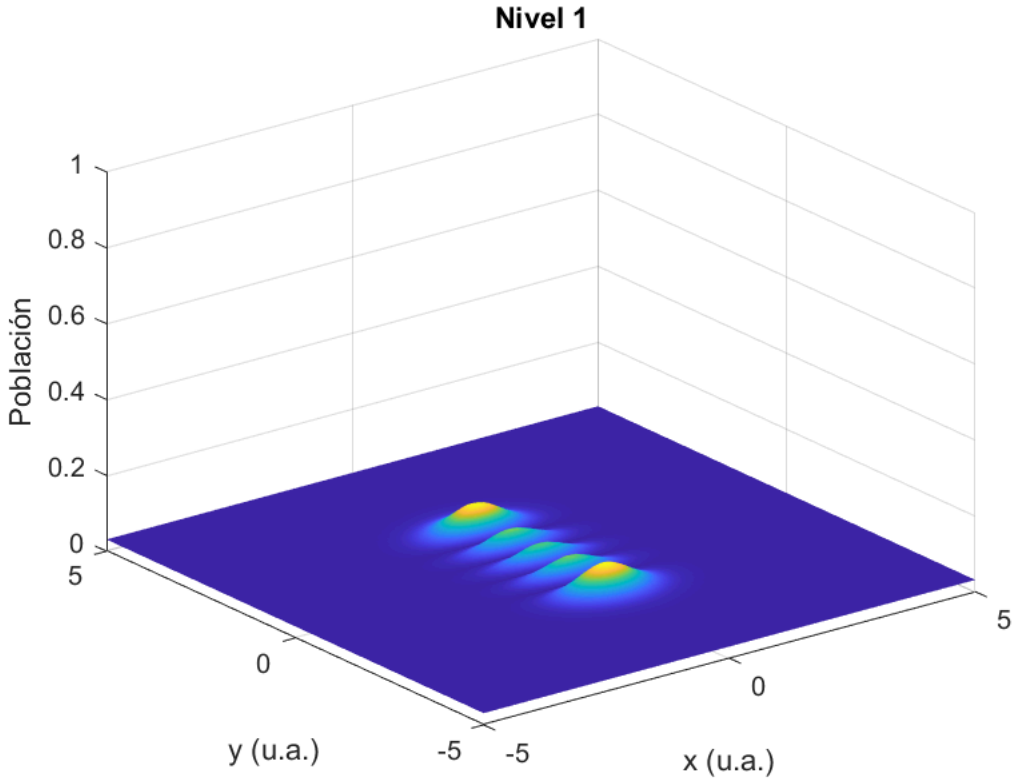

```
j = 6
nomFile =
'nivel17.dat'
z = 2601×1
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
    0.0687
     ⋮
filename =
'nivel17.jpg'
```



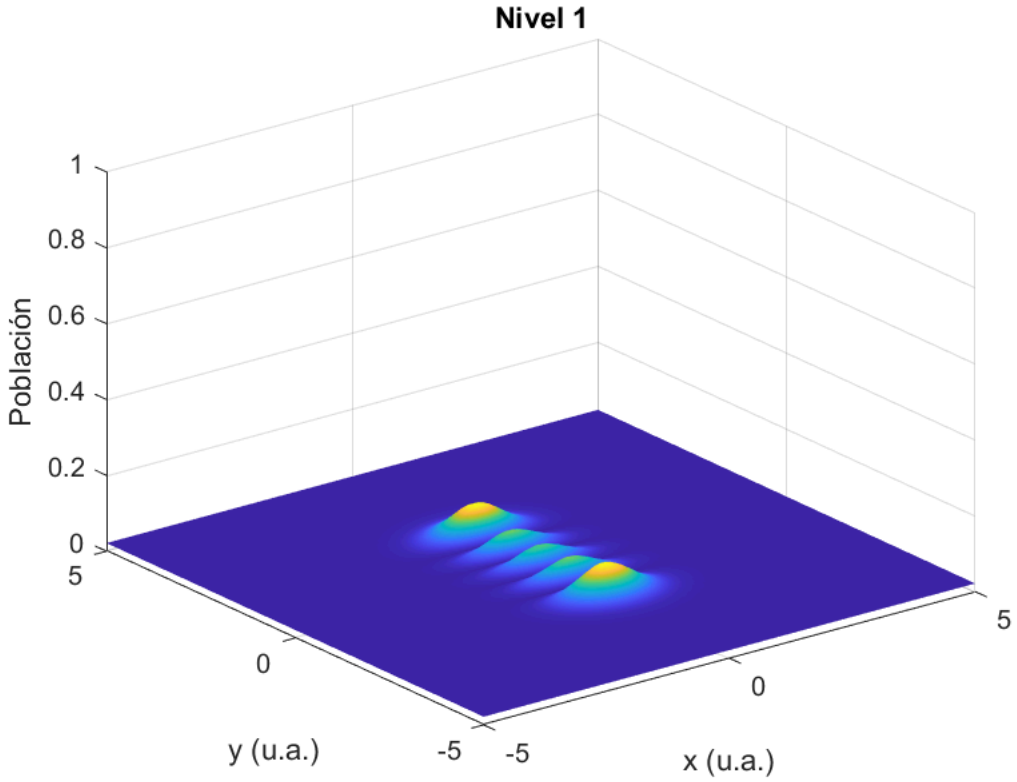

```
j = 7
nomFile =
'nivel18.dat'
z = 2601×1
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
    0.0456
      ⋮
filename =
'nivel18.jpg'
```



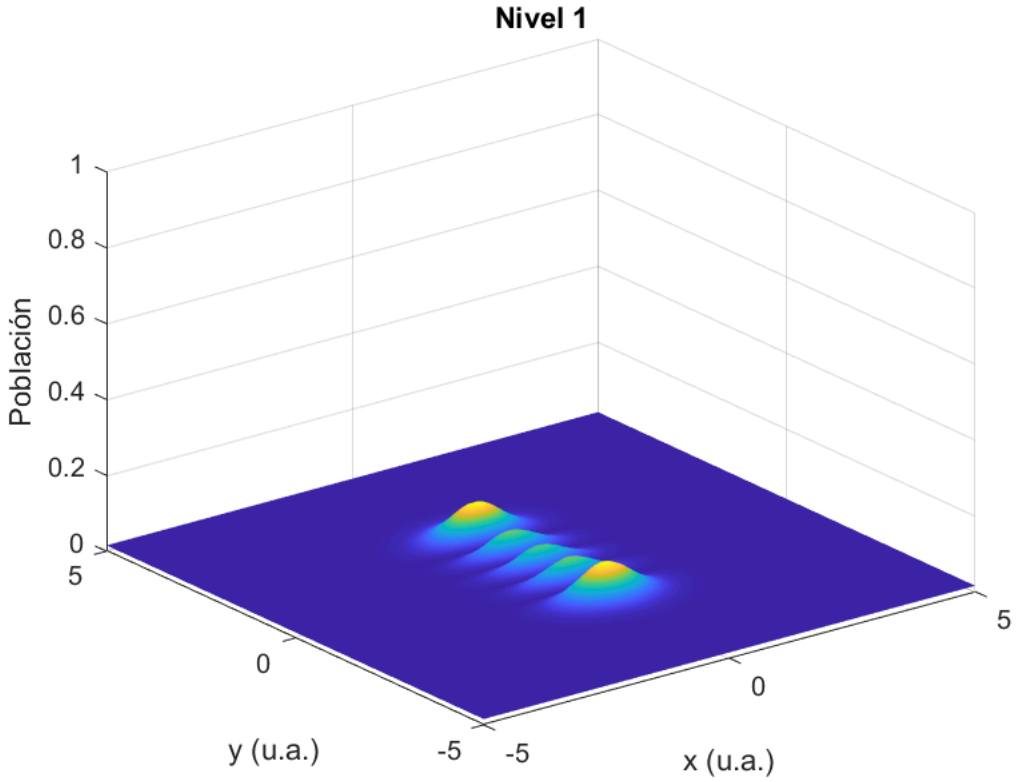

```
j = 8
nomFile =
'nivel19.dat'
z = 2601×1
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
    0.0309
      ⋮
filename =
'nivel19.jpg'
```



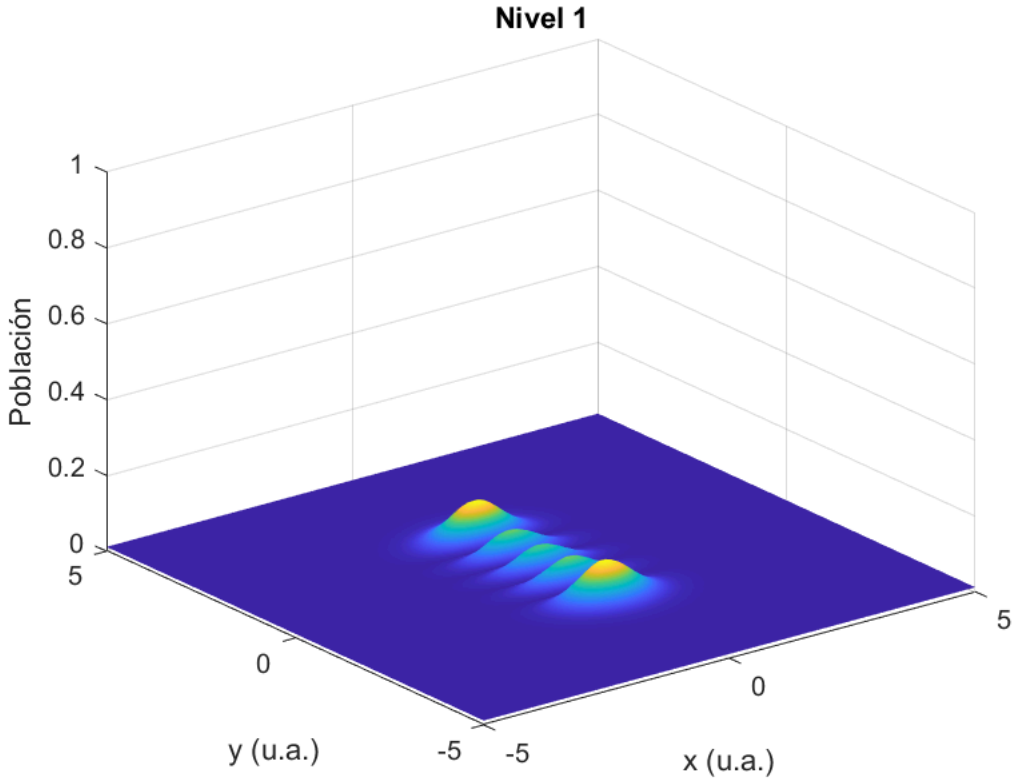

```
j = 9
nomFile =
'nivel110.dat'
z = 2601×1
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
    0.0214
      ⋮
filename =
'nivel110.jpg'
```



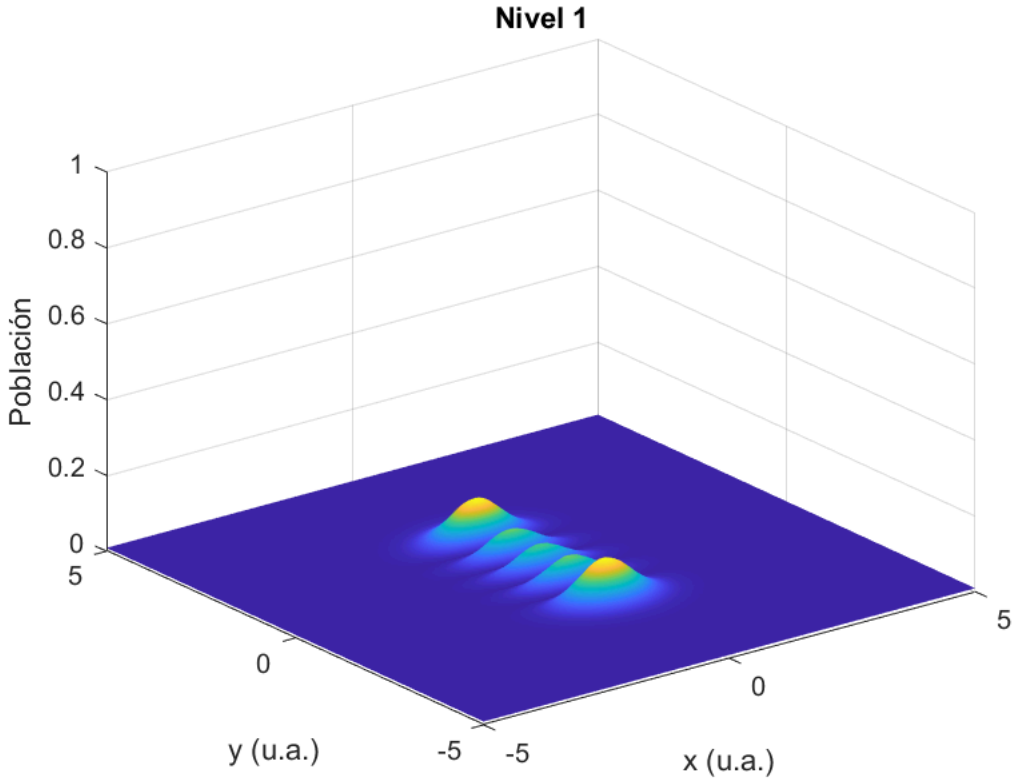

```
j = 10
nomFile =
'nivel111.dat'
z = 2601×1
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
    0.0154
      ⋮
filename =
'nivel111.jpg'
```



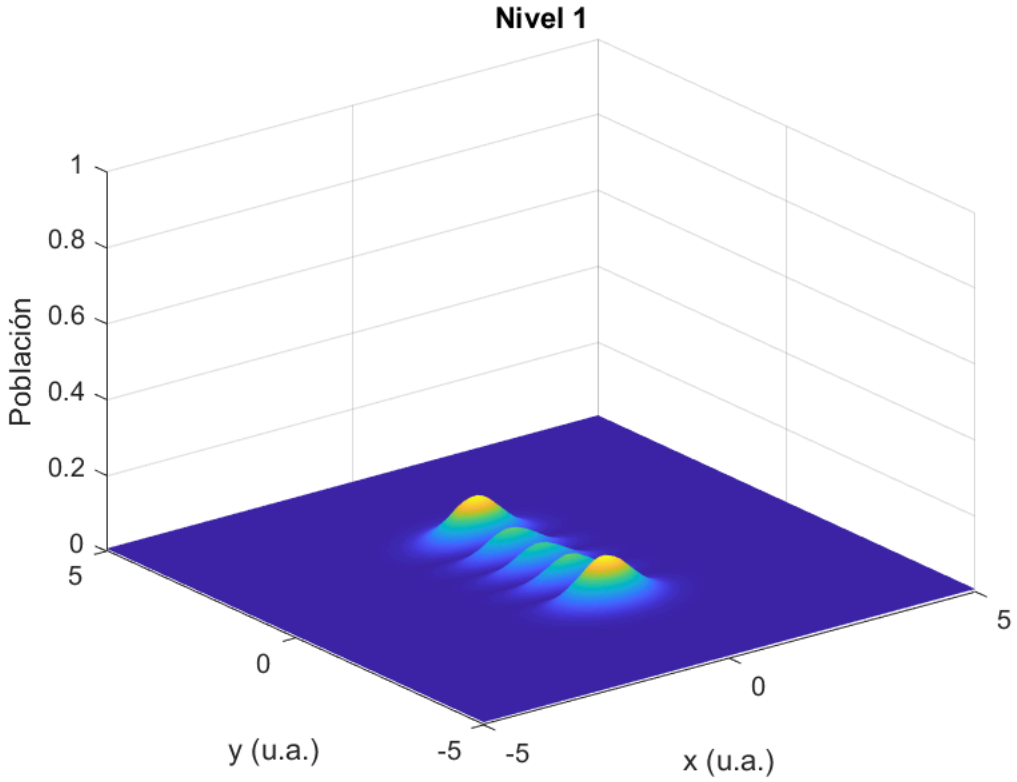

```
j = 11
nomFile =
'nivel112.dat'
z = 2601×1
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
    0.0114
      ⋮
filename =
'nivel112.jpg'
```



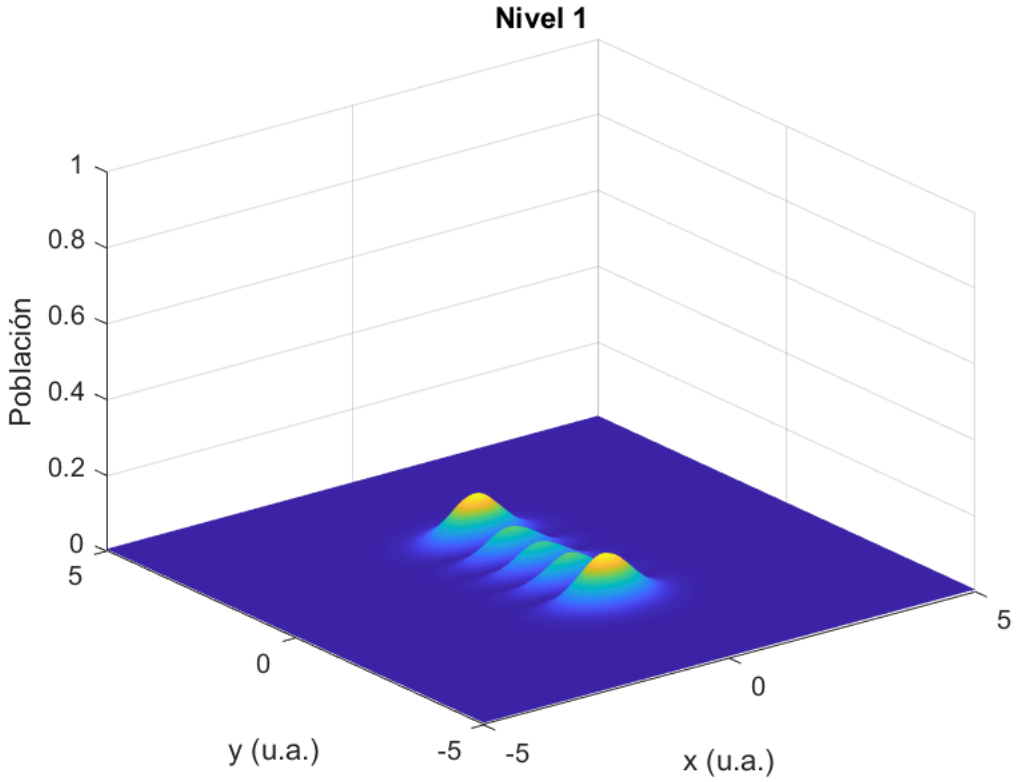

```
j = 12
nomFile =
'nivel113.dat'
z = 2601×1
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
    0.0088
      ⋮
filename =
'nivel113.jpg'
```



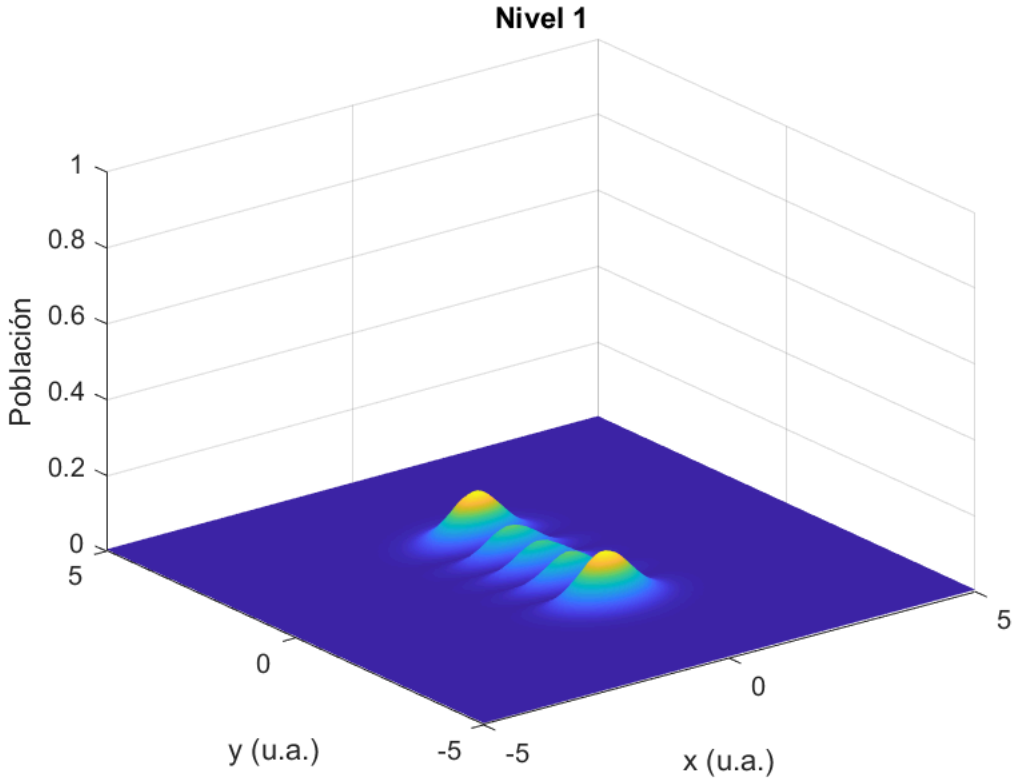

```
j = 13
nomFile =
'nivel114.dat'
z = 2601×1
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
    0.0070
      ⋮
filename =
'nivel114.jpg'
```




```
j = 14
nomFile =
'nivel115.dat'
z = 2601×1
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
    0.0058
     ⋮
filename =
'nivel115.jpg'
```




```
j = 15
nomFile =
'nivel116.dat'
z = 2601×1
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
    0.0050
      ⋮
filename =
'nivel116.jpg'
```

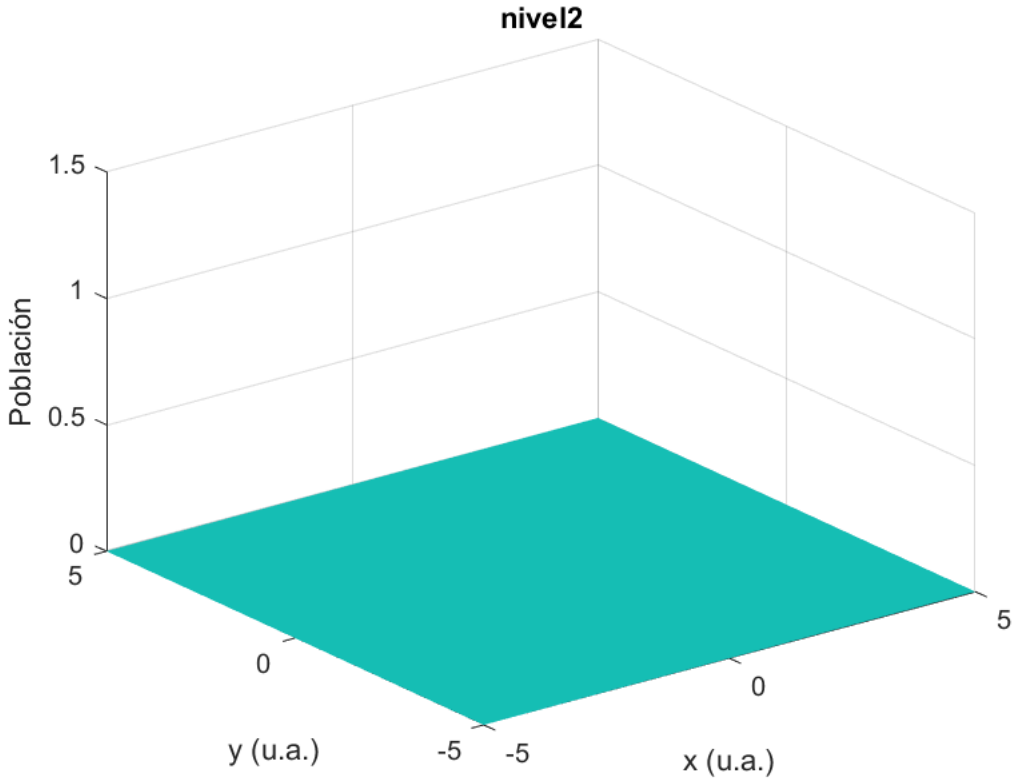



```
j = 16
```

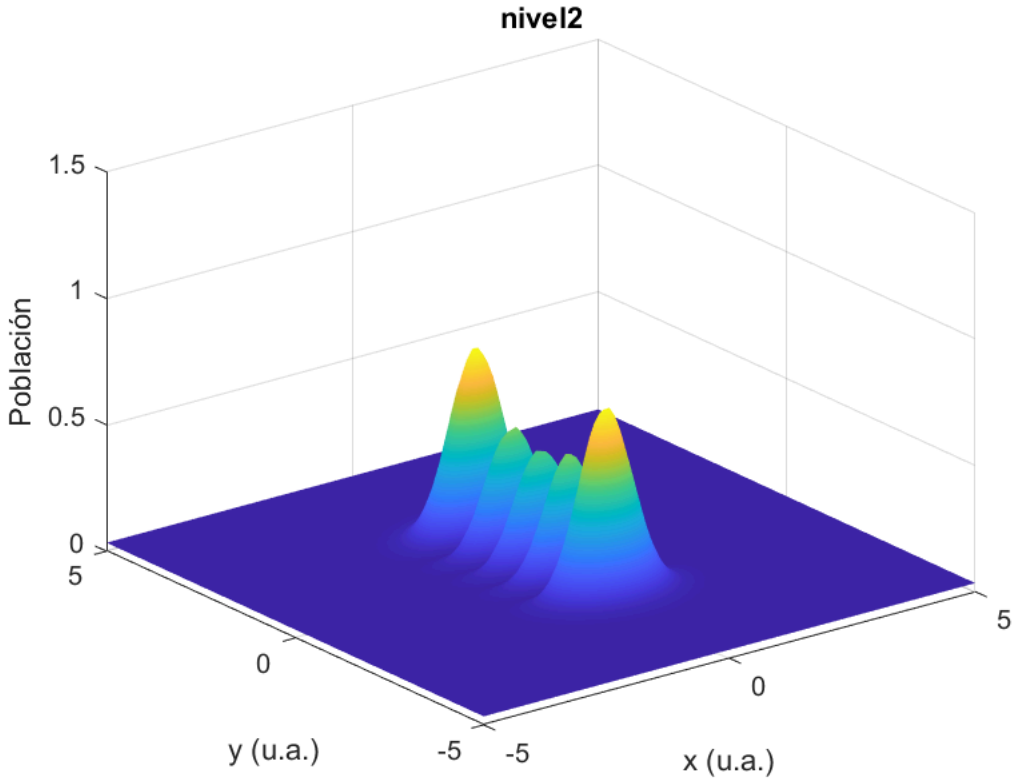
```
u = VideoWriter('nivel1.avi','Motion JPEG AVI');
u.FrameRate=5;
u.Quality=100;
open(u);
writeVideo(u,nivel1);
close(u);

%_____________________________VIDEO_POBLACIÓN_NIVEL_2_____________________________
%%Análogo al caso anterior
di=1;
df=20;
ndz2=df-di;
nivel2(ndz2)=struct('cdata',[],'colormap',[]);
for j=di:df
    nomFile=sprintf('nivel2%d.dat',j)
    Esp=importdata(nomFile,' ');
    x=Esp(:,1);
    y=Esp(:,2);
    z=Esp(:,3)

    xlin=linspace(min(x),max(x),90);
    ylin=linspace(min(y),max(y),90);
    [X,Y]=meshgrid(xlin,ylin);
    Z=griddata(x,y,z,X,Y,'cubic');
```

```
    figure
    surf(X,Y,Z)
    shading interp
    title('nivel2', 'FontSize', 16, 'FontName', 'Helvetica');
    xlabel(' x (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    ylabel(' y (u.a.)', 'FontSize', 12, 'FontName', 'Helvetica');
    zlabel('Población', 'FontSize', 12, 'FontName', 'Helvetica');
    set(gca, 'FontSize', 10, 'FontName', 'Helvetica');
    zlim([0,1.5])


    filename=sprintf('nivel2%d.jpg',j)
    nivel2(j) = getframe(gcf,rect);

    j
end
```

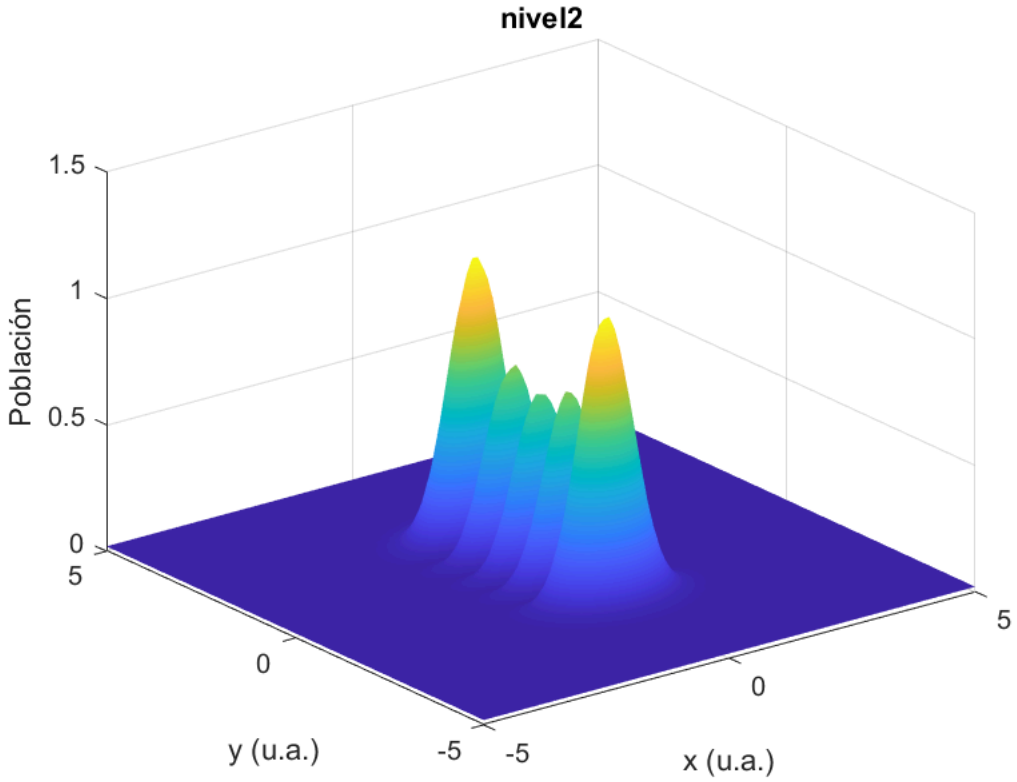
```
nomFile =
'nivel21.dat'
z = 2601×1
     0
     0
     0
     0
     0
     0
     0
     0
     0
     0
     ⋮
filename =
'nivel21.jpg'
```



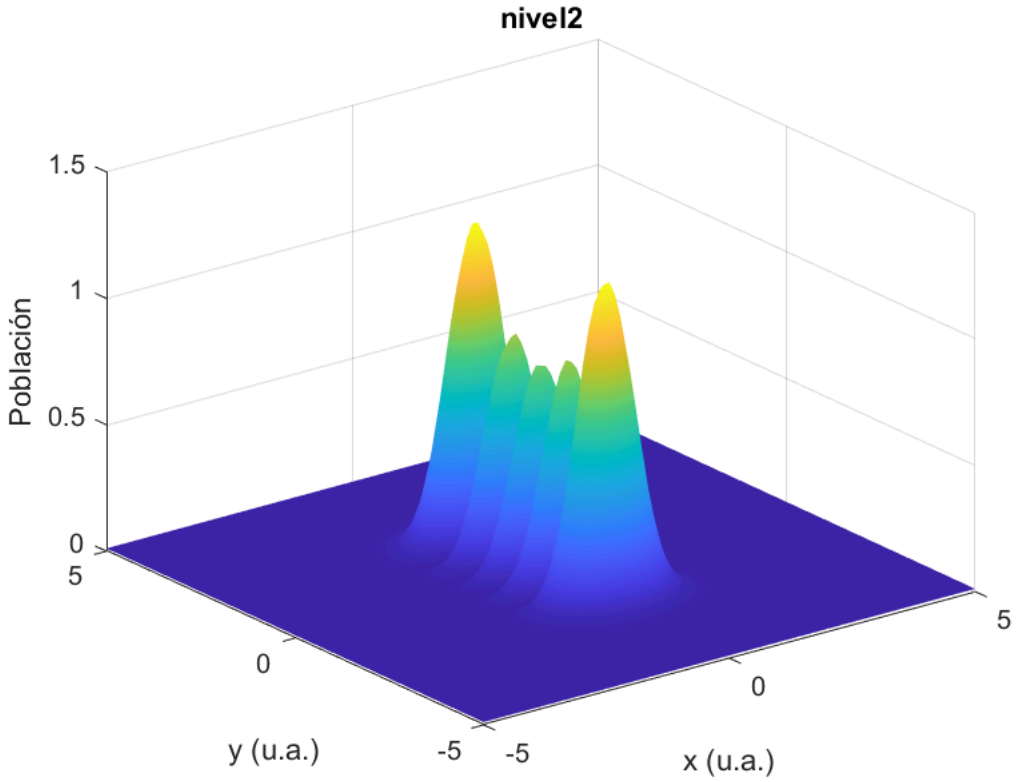

```
j = 1
nomFile =
'nivel22.dat'
z = 2601×1
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
    0.0336
     ⋮
filename =
'nivel22.jpg'
```



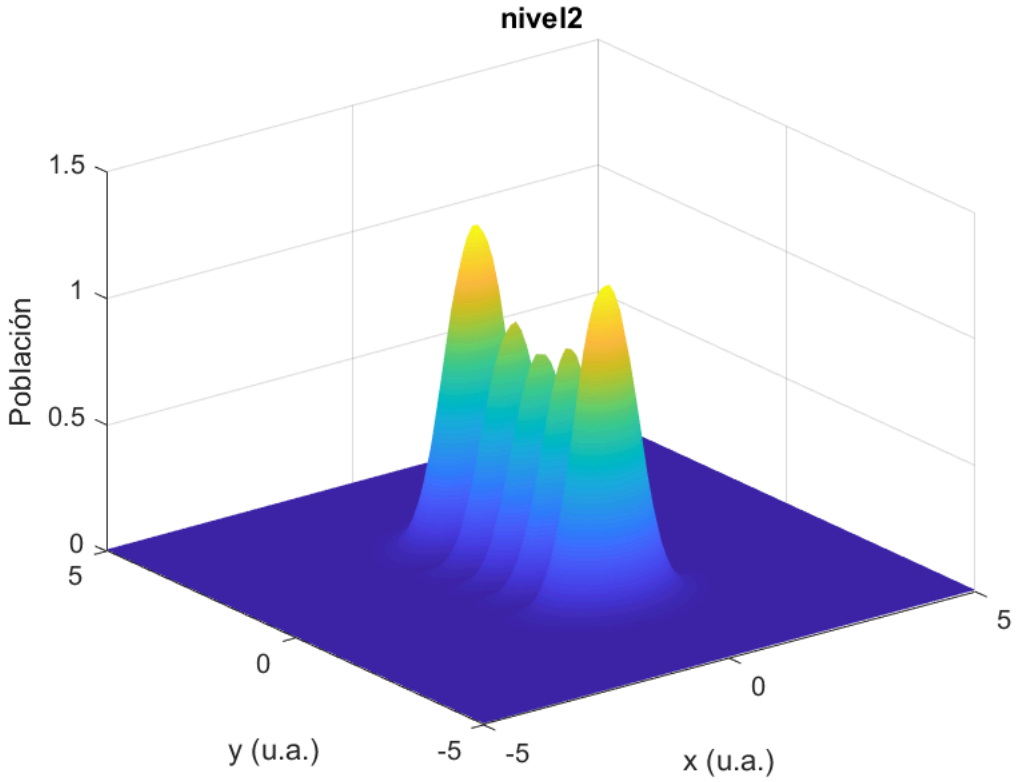

```
j = 2
nomFile =
'nivel23.dat'
z = 2601×1
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
    0.0191
     ⋮
filename =
'nivel23.jpg'
```



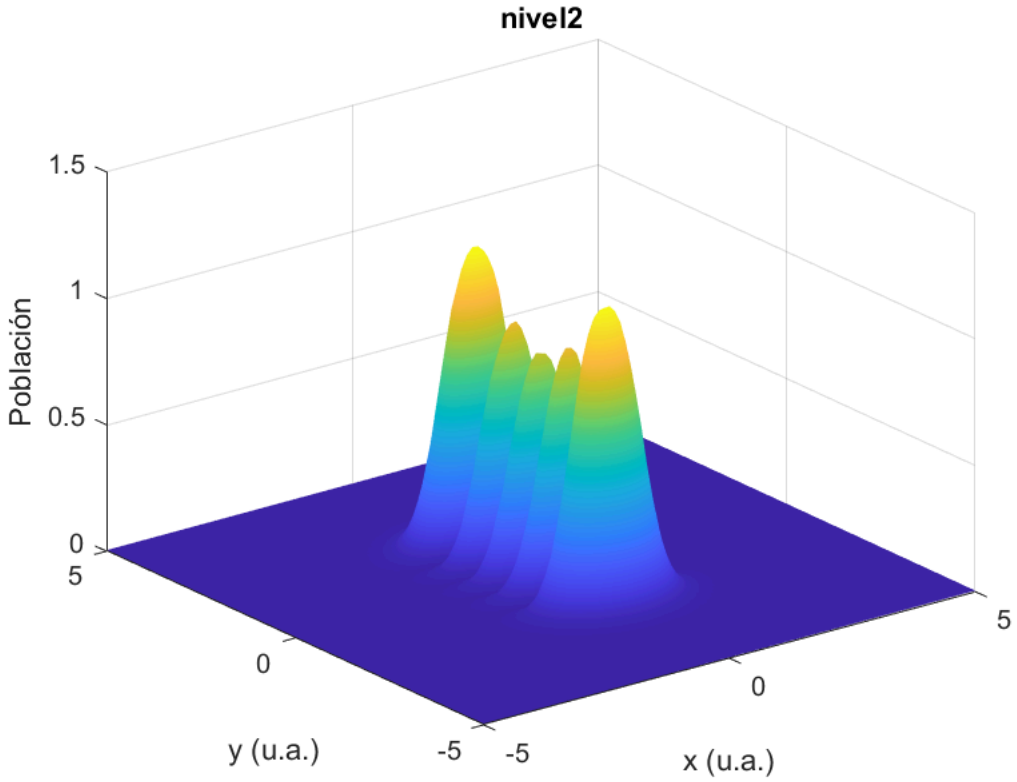

```
j = 3
nomFile =
'nivel24.dat'
z = 2601×1
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
    0.0111
     ⋮
filename =
'nivel24.jpg'
```



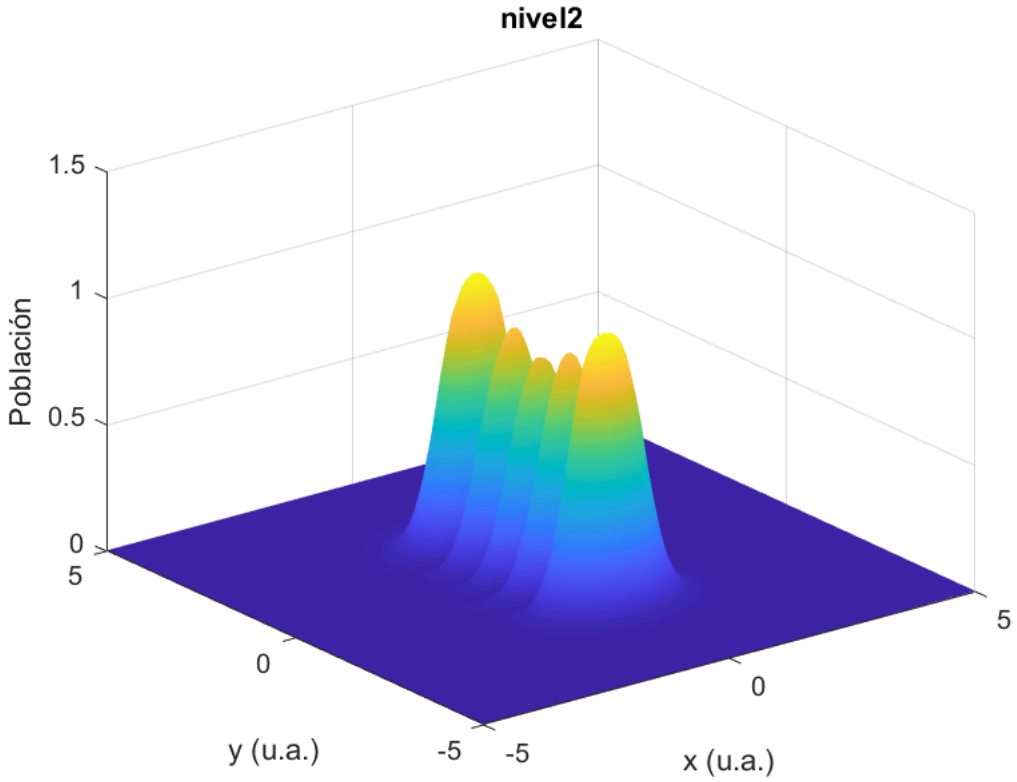

```
j = 4
nomFile =
'nivel25.dat'
z = 2601×1
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
    0.0067
      ⋮
filename =
'nivel25.jpg'
```



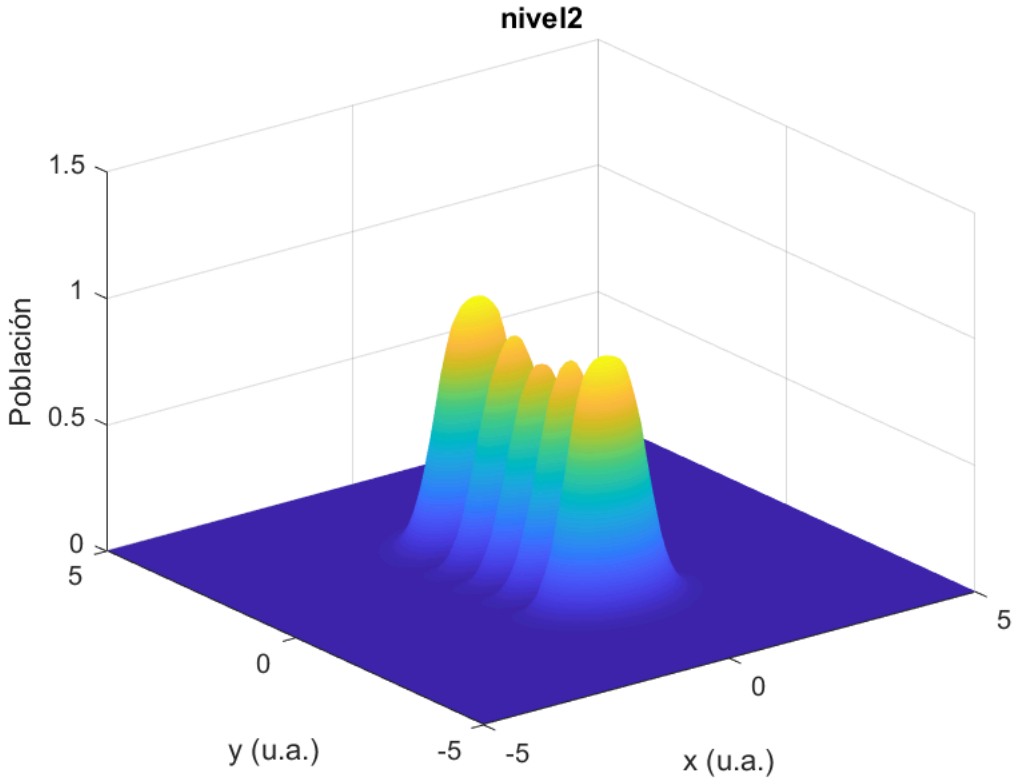

```
j = 5
nomFile =
'nivel26.dat'
z = 2601×1
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
    0.0041
      ⋮
filename =
'nivel26.jpg'
```



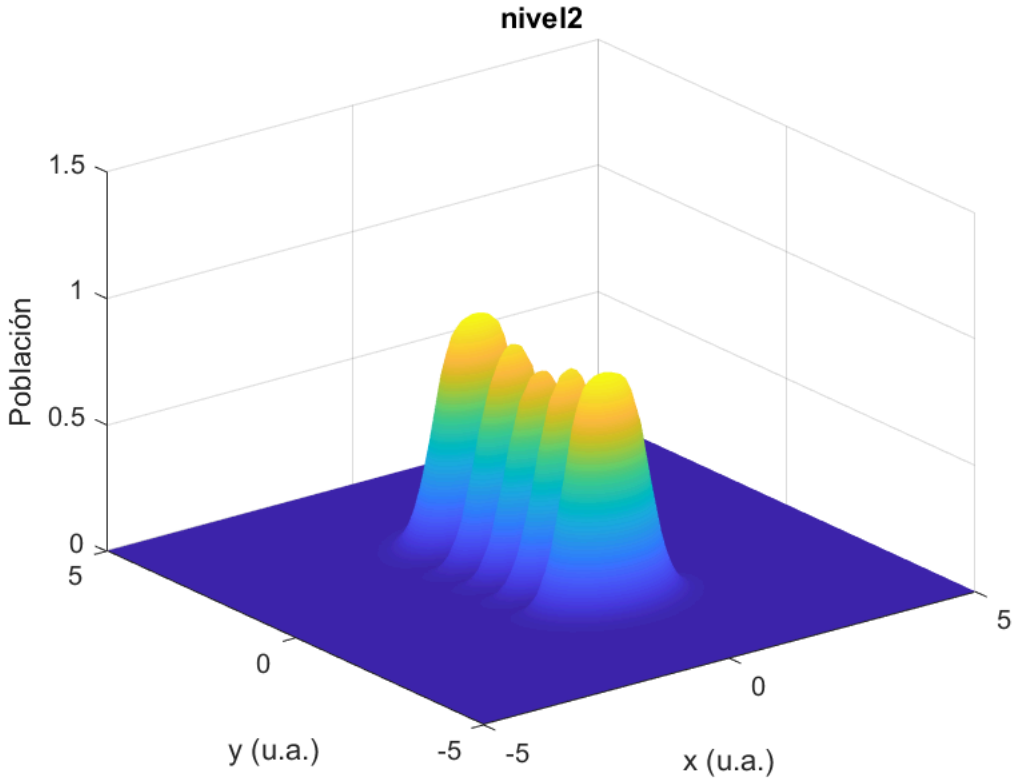

```
j = 6
nomFile =
'nivel27.dat'
z = 2601×1
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
    0.0025
      ⋮
filename =
'nivel27.jpg'
```



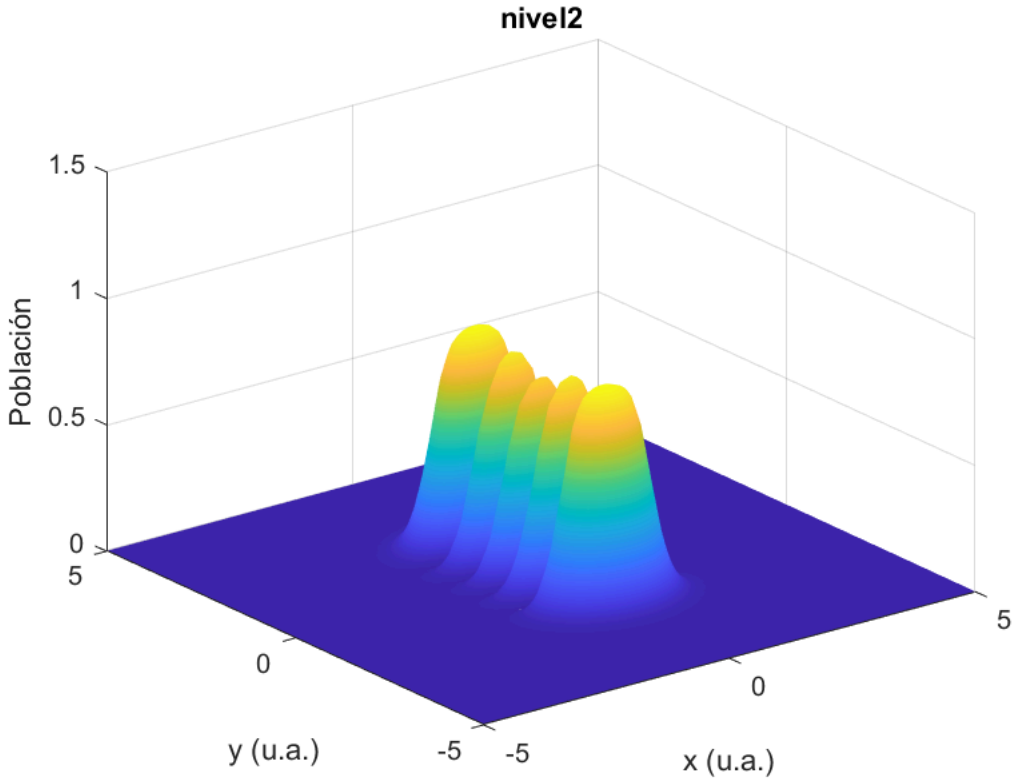

```
j = 7
nomFile =
'nivel28.dat'
z = 2601×1
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
    0.0016
      ⋮
filename =
'nivel28.jpg'
```



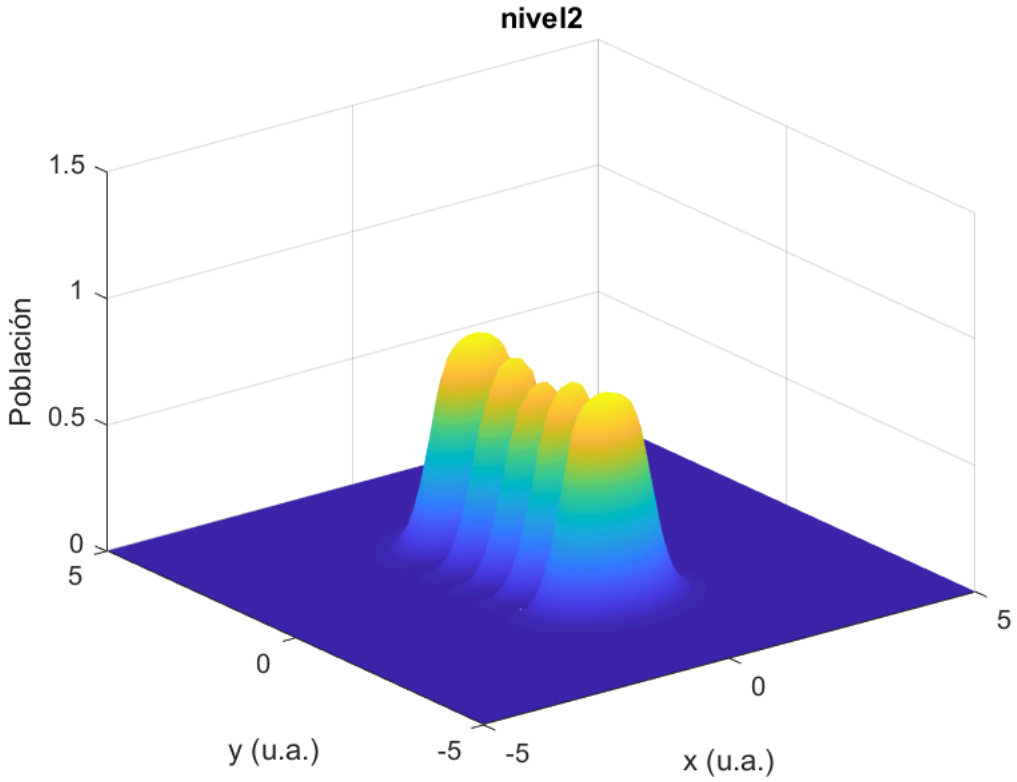

```
j = 8
nomFile =
'nivel29.dat'
z = 2601×1
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
    0.0010
      ⋮
filename =
'nivel29.jpg'
```



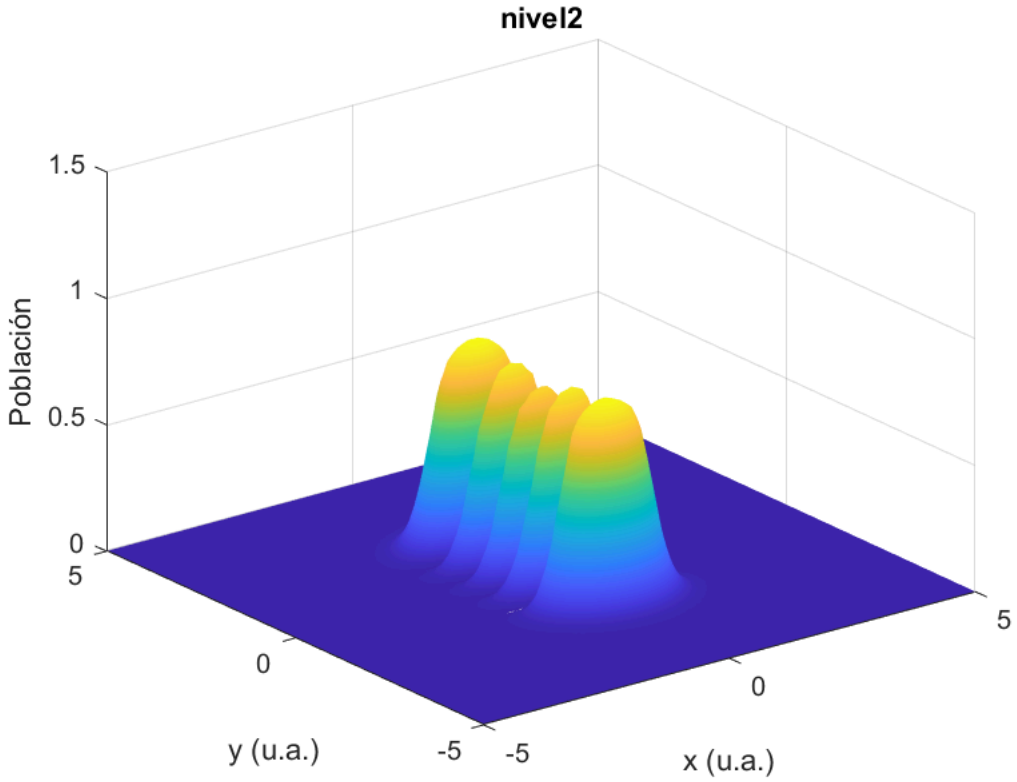

```
j = 9
nomFile =
'nivel210.dat'
z = 2601×1
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
    0.0006
      ⋮
filename =
'nivel210.jpg'
```



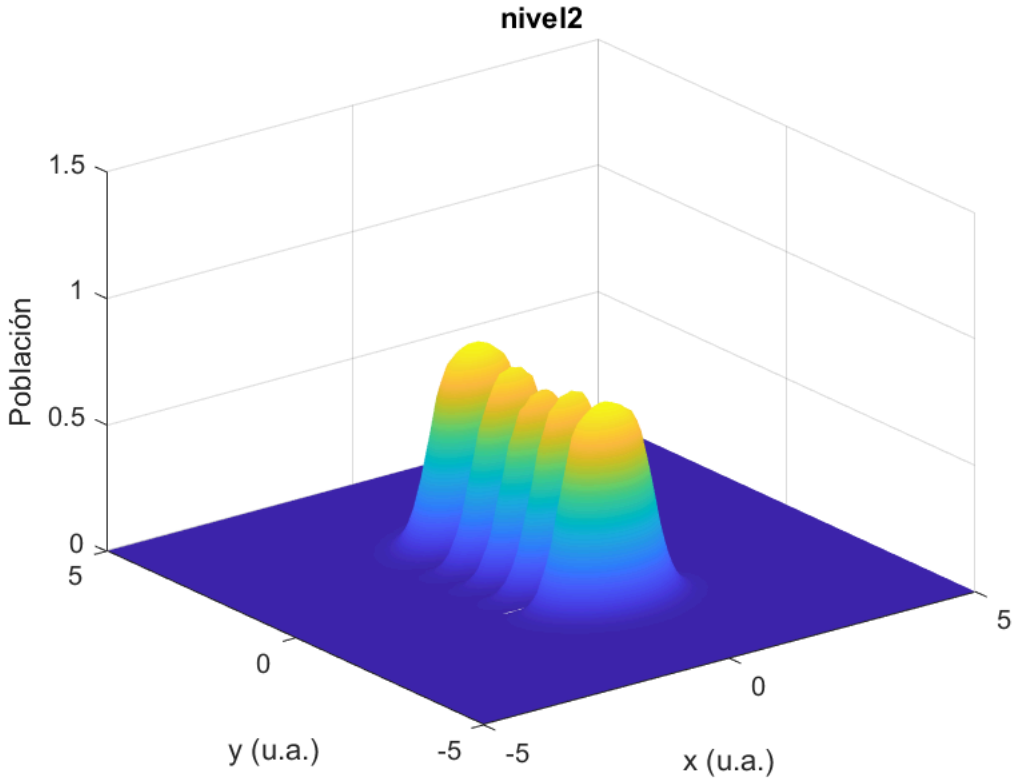

```
j = 10
nomFile =
'nivel211.dat'
z = 2601×1
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
    0.0004
      ⋮
filename =
'nivel211.jpg'
```



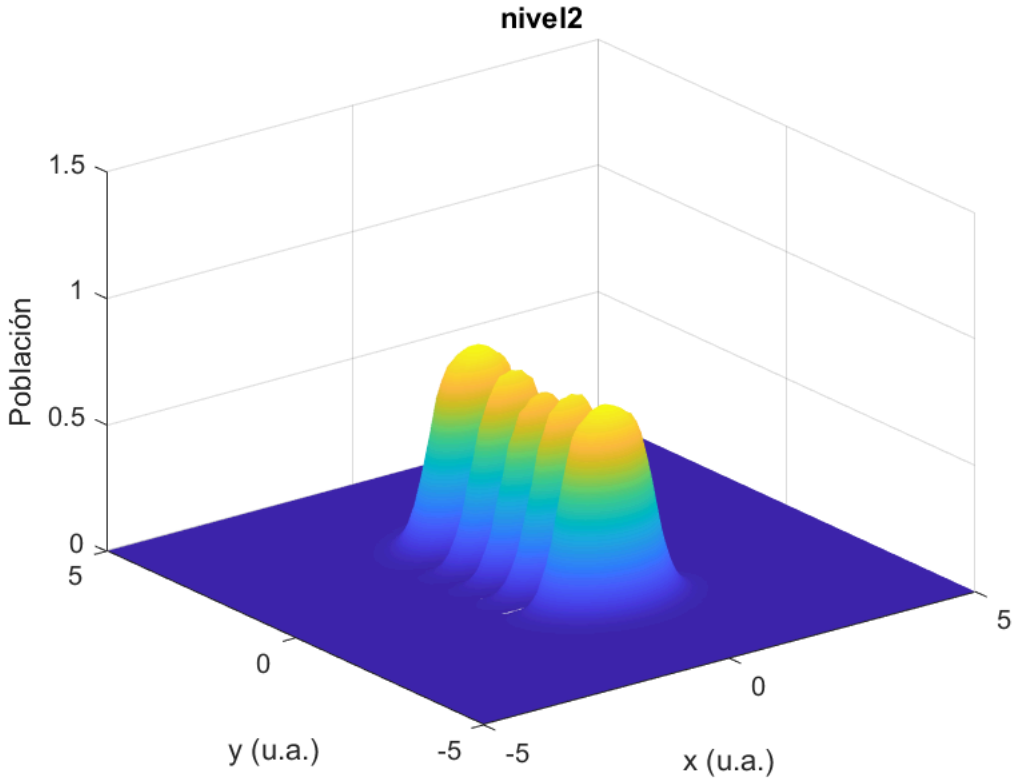

```
j = 11
nomFile =
'nivel212.dat'
z = 2601×1
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
    0.0003
      ⋮
filename =
'nivel212.jpg'
```



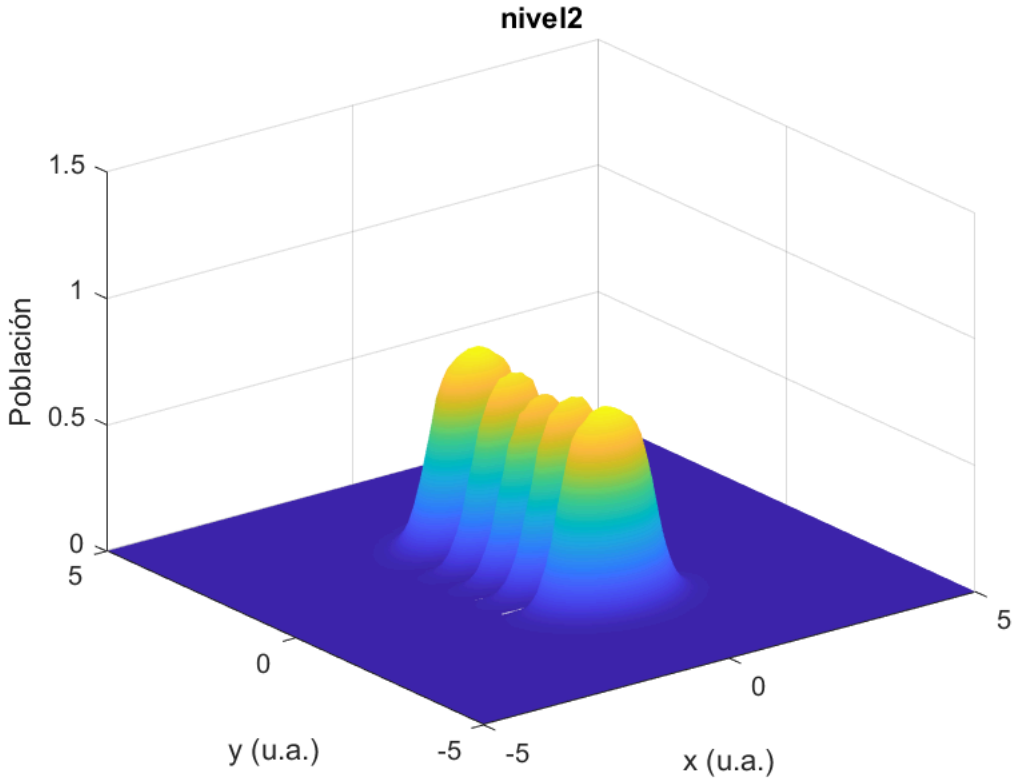

```
j = 12
nomFile =
'nivel213.dat'
z = 2601×1
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
    0.0002
      ⋮
filename =
'nivel213.jpg'
```



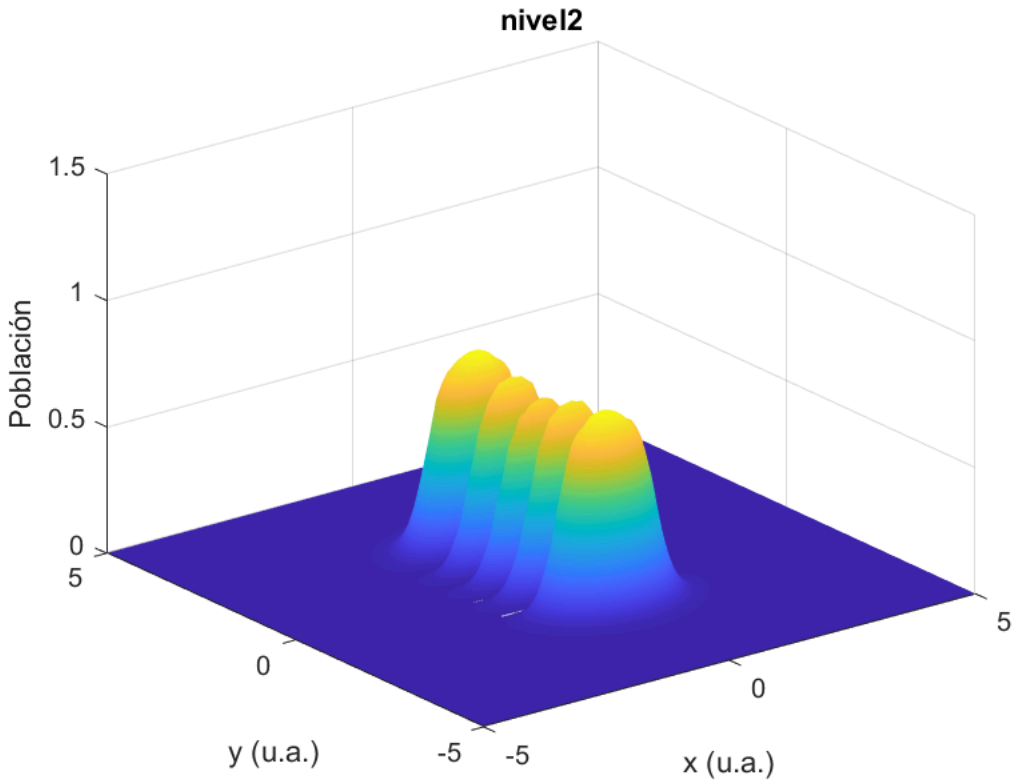

```
j = 13
nomFile =
'nivel214.dat'
z = 2601×1
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
      ⋮
filename =
'nivel214.jpg'
```



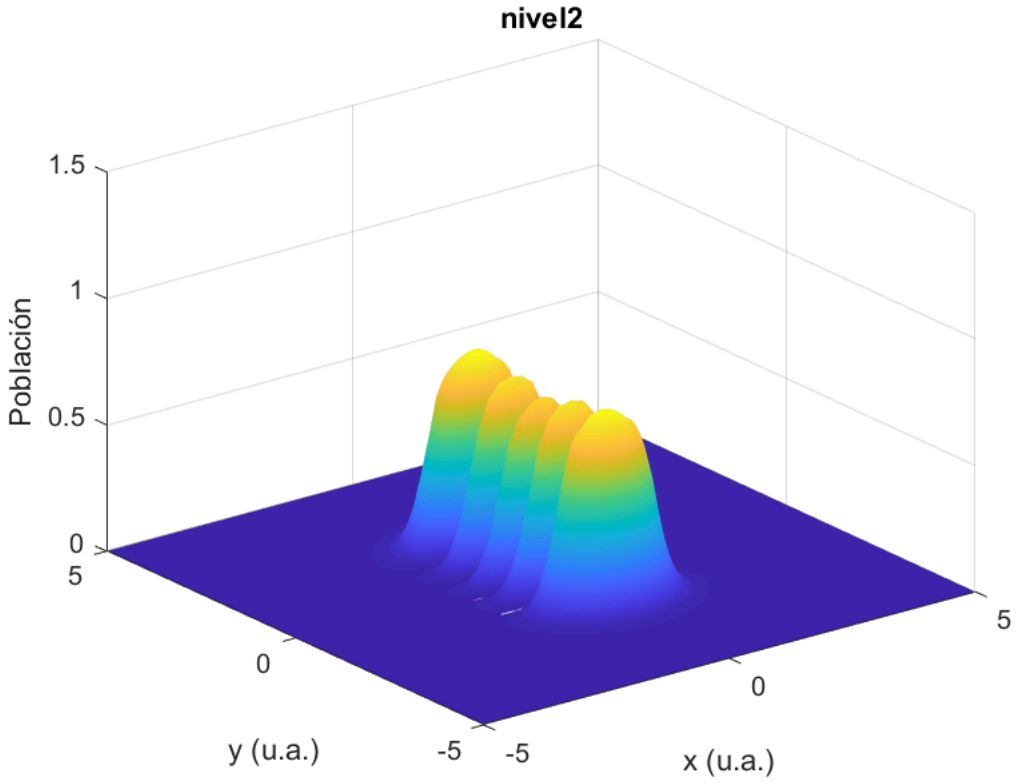

```
j = 14
nomFile =
'nivel215.dat'
z = 2601×1
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
    0.0001
      ⋮
filename =
'nivel215.jpg'
```



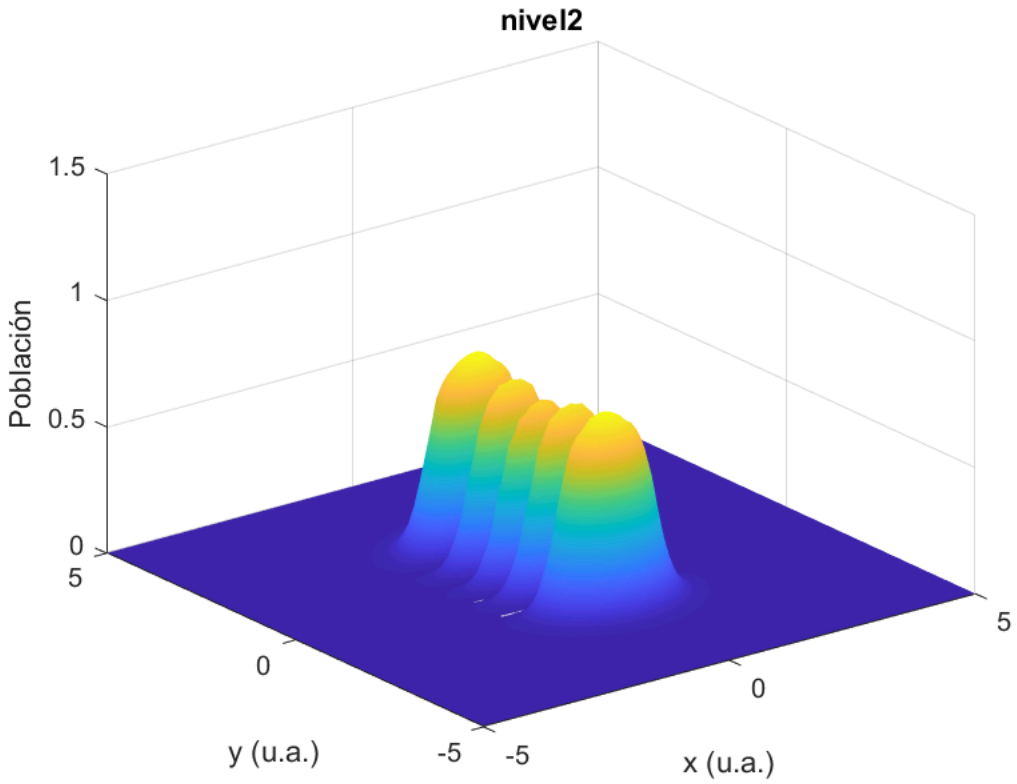

```
j = 15
nomFile =
'nivel216.dat'
z = 2601×1
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
      ⋮
filename =
'nivel216.jpg'
```



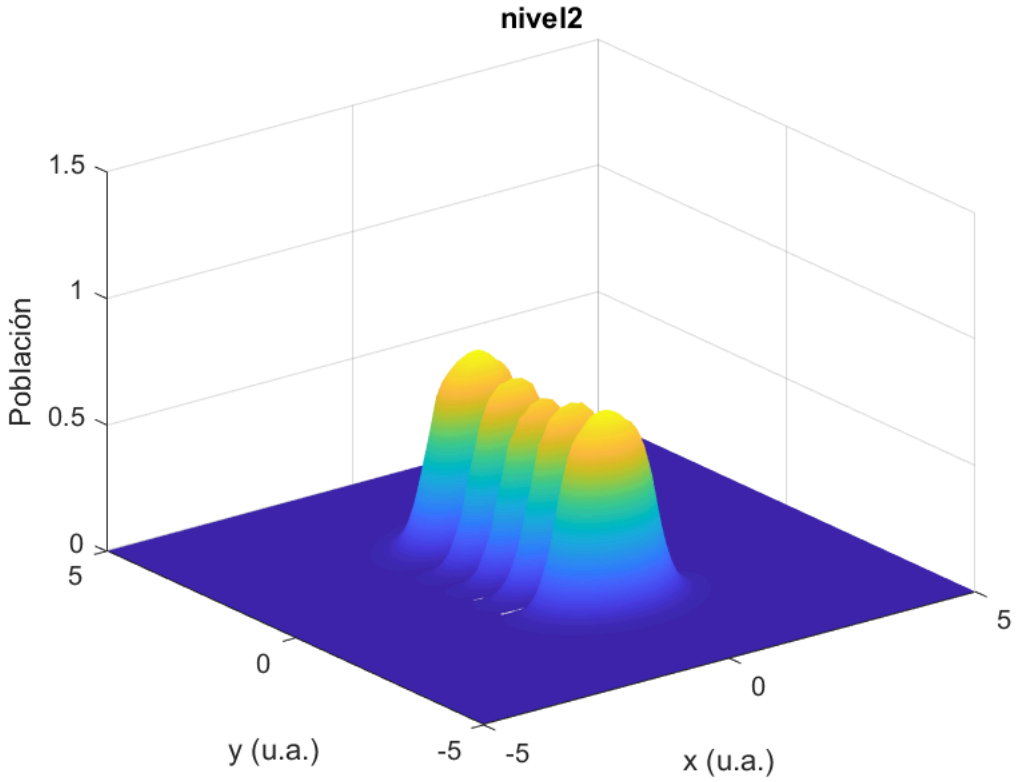

```
j = 16
nomFile =
'nivel217.dat'
z = 2601×1
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
      ⋮
filename =
'nivel217.jpg'
```



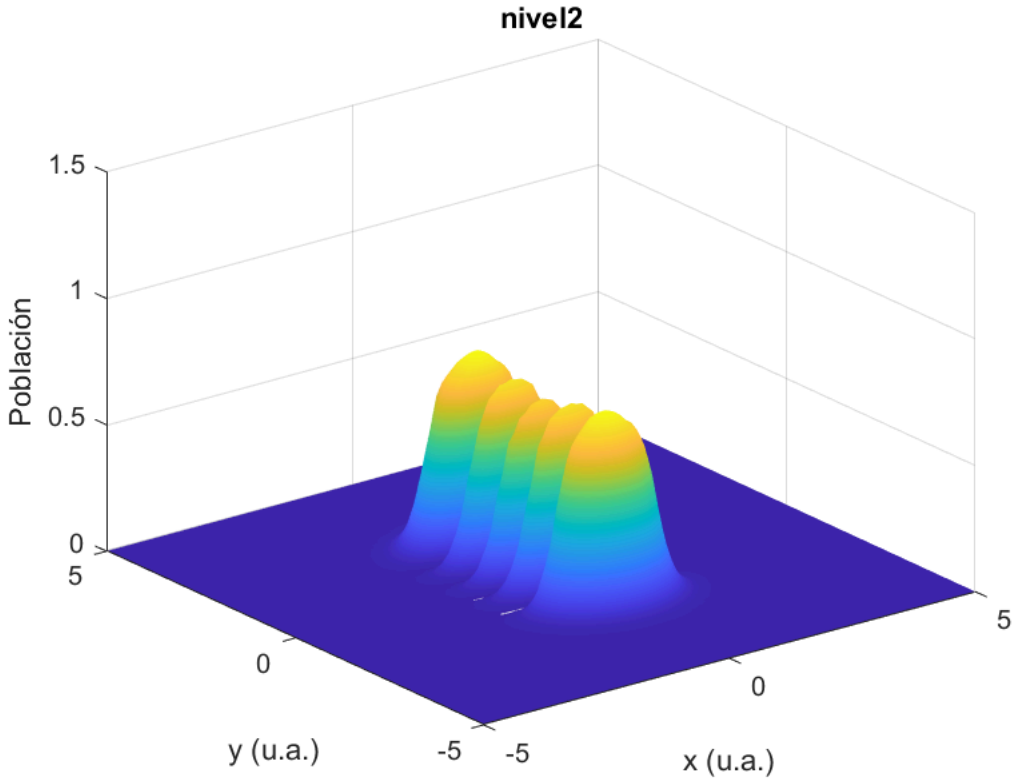

```
j = 17
nomFile =
'nivel218.dat'
z = 2601×1
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
      ⋮
filename =
'nivel218.jpg'
```




```
j = 18
nomFile =
'nivel219.dat'
z = 2601×1
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
      ⋮
filename =
'nivel219.jpg'
```




```
j = 19
nomFile =
'nivel220.dat'
z = 2601×1
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
    0.0000
      ⋮
filename =
'nivel220.jpg'
```




```
j = 20
```

```
w = VideoWriter('nivel2.avi','Motion JPEG AVI');
w.FrameRate=5;
w.Quality=100;
open(w);
writeVideo(w,nivel2);
close(w);
```