

TOMOGRAFÍA POR EMISIÓN DE POSITRONES

1.- P.E.T.

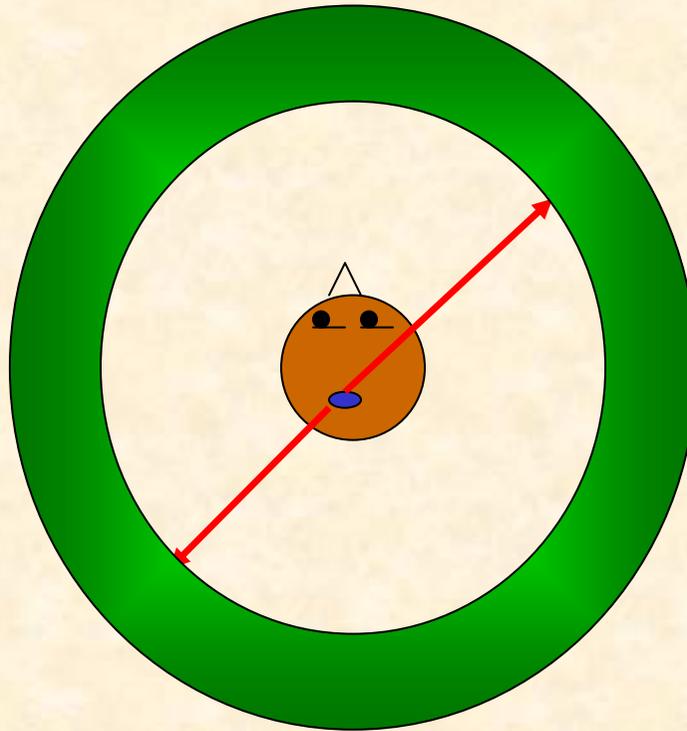
2.- SIMULADOR

3.- IMAGEN

1.- P.E.T.

- Introducción al P.E.T.
- Parámetros P.E.T.

Introducción al P.E.T.



**RADIOISÓTOPOS
 β^+ DE
VIDA CORTA**

**2 RAYOS γ
COLINEALES**

Introducción al P.E.T.



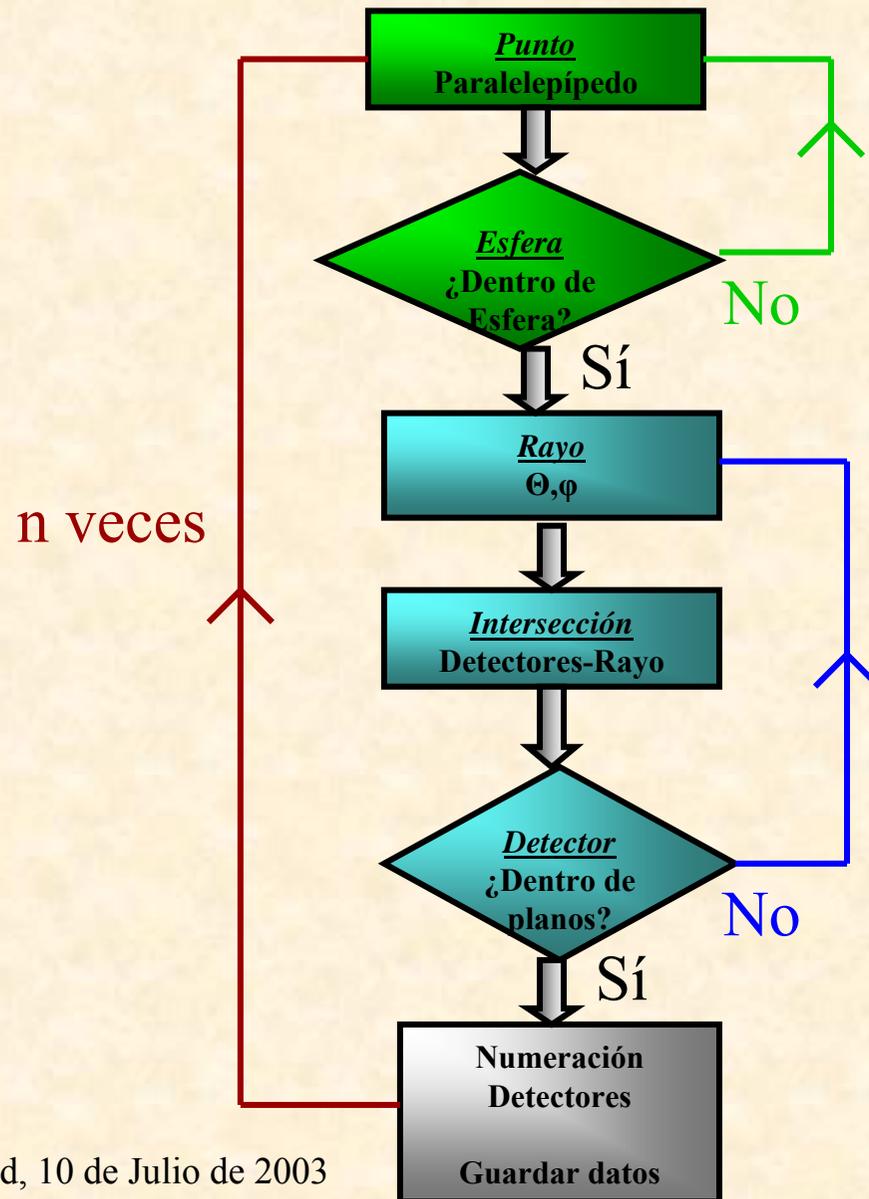
Parámetros P.E.T.

- EFICIENCIA DEL DETECTOR
- SENSIBILIDAD DEL SISTEMA
- RESOLUCIÓN TEMPORAL
- RESOLUCIÓN ESPACIAL
- RITMO DE RECuento

2.- SIMULADOR

- Escaner
- Geometría del Sistema
- Adquisición 2D
- Disposición de los Detectores
- Normalización

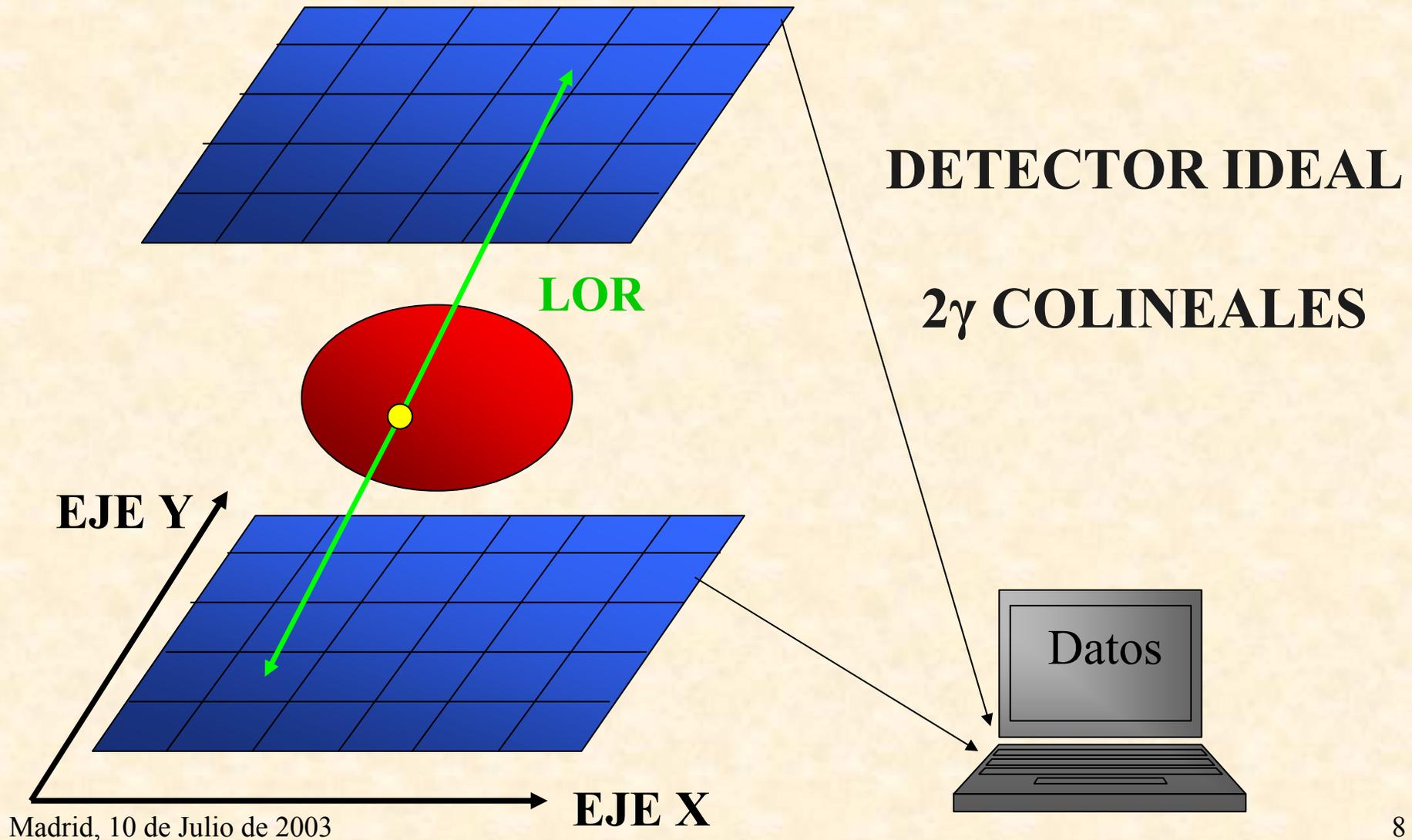
Escaner



**PROGRAMA DE
SIMULACIÓN**

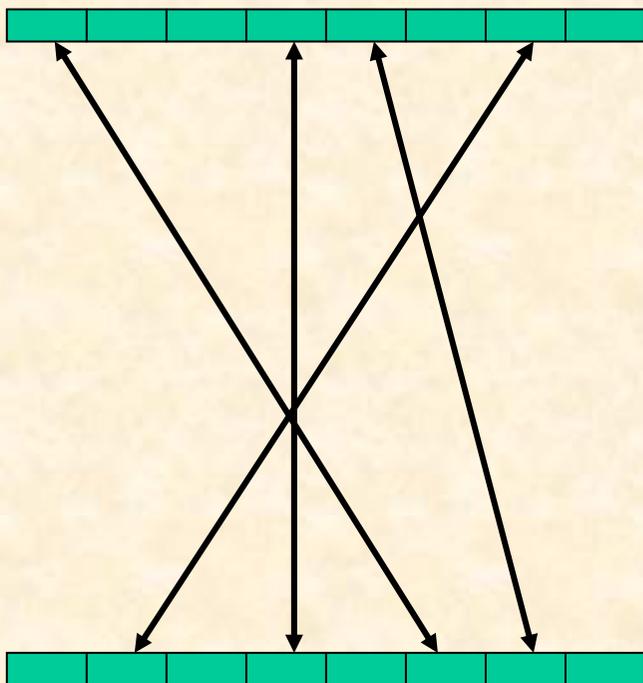
**MÉTODO
MONTECARLO**

Geometría del Sistema

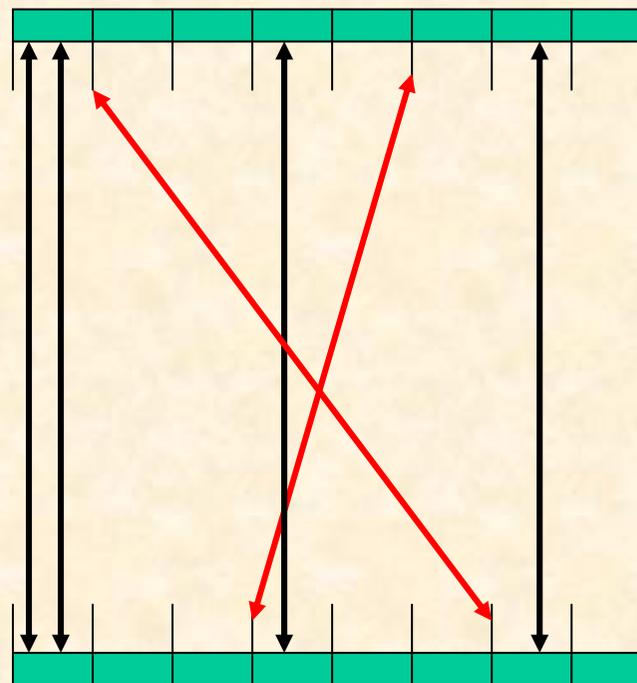


Adquisición 2D

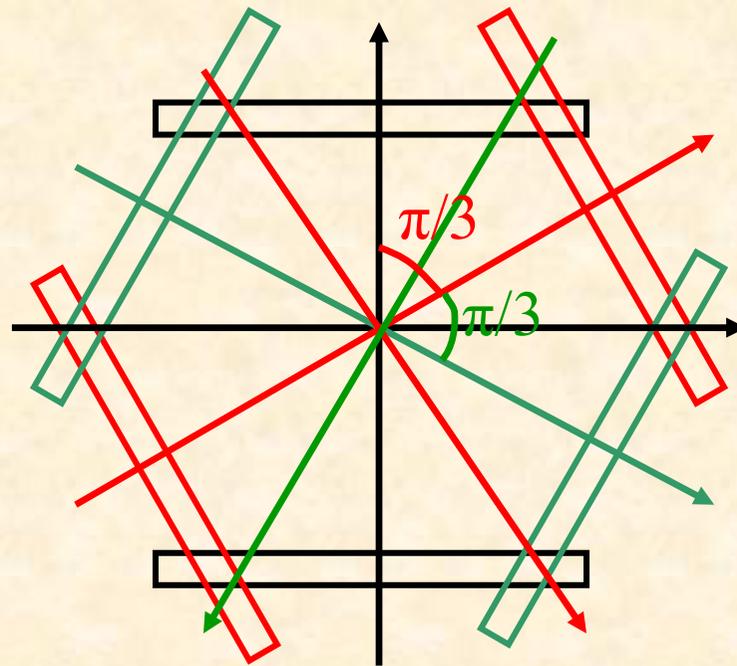
EJE X



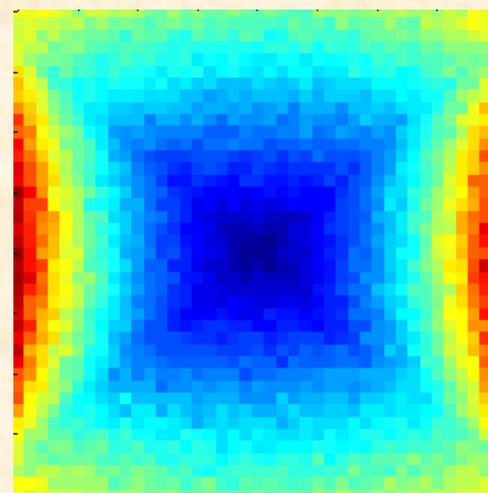
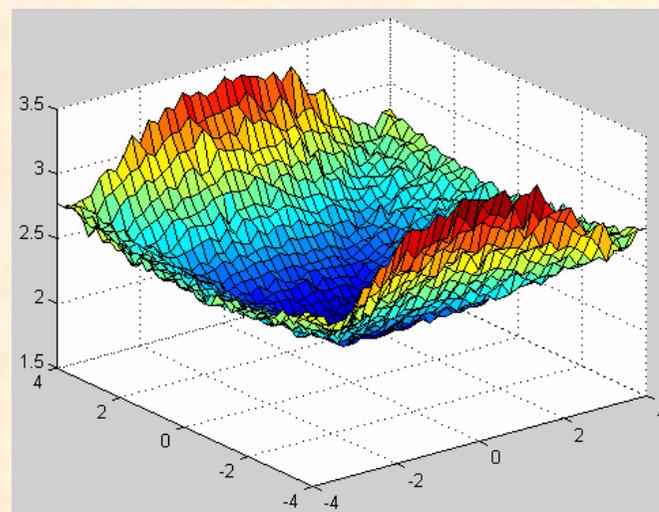
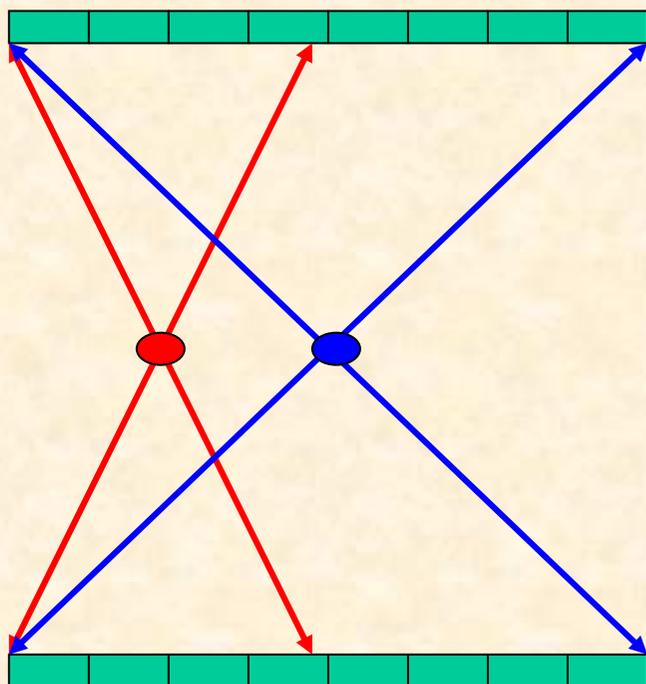
EJE Y



Disposición de los Detectores



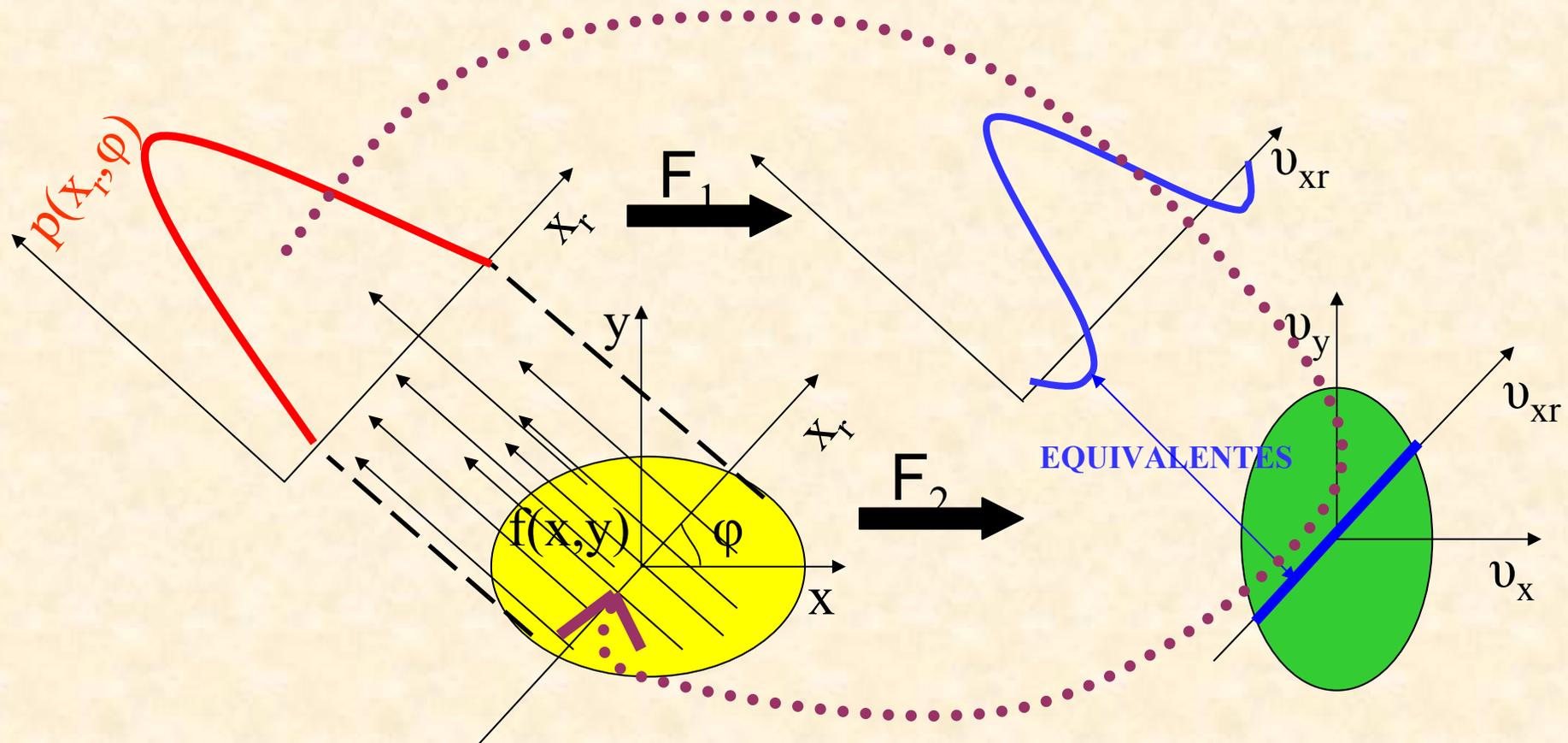
Normalización



3.- IMAGEN

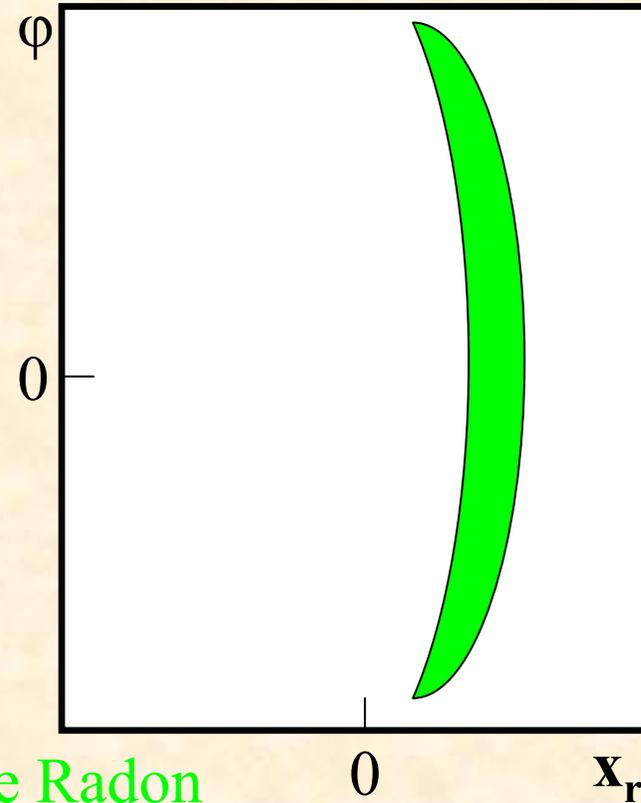
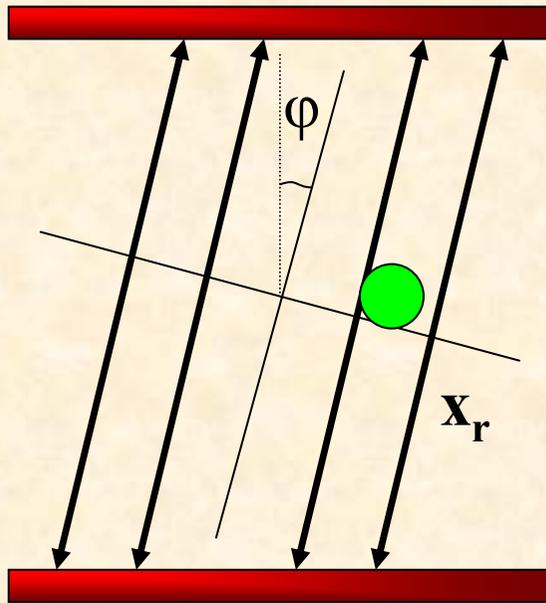
- Proyecciones. Teorema de la sección central
- Retroproyección Filtrada
- Sinograma
- Filtros
- Frecuencia de Nyquist
- Implementación
- Resolución
- Imágenes Obtenidas

Proyecciones. Teorema de la sección central



$$f(x, y) = \int_0^\pi \left[\int_{-\infty}^{+\infty} dv_{x_r} e^{2\pi i v_{x_r} x_r} |v_{x_r}| W(v_{x_r}) \left(\int_{-\infty}^{+\infty} dx_r e^{-2\pi i v_{x_r} x_r} p(x_r, \phi) \right) \right] d\phi$$

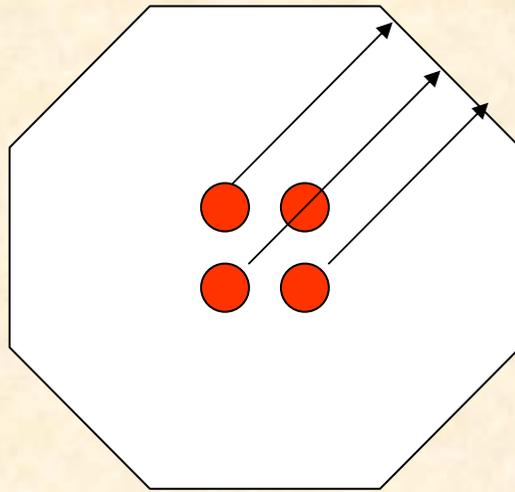
Sinograma



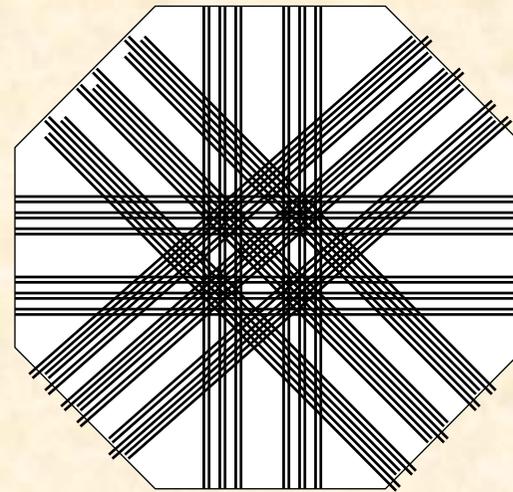
Transformada de Radon

$$P(x_r, \phi) = \int_{-\infty}^{+\infty} \int_{-\infty}^{+\infty} f(x, y) \delta(x \cos \phi + y \sin \phi - x_r) dx dy$$

Retroproyección Filtrada



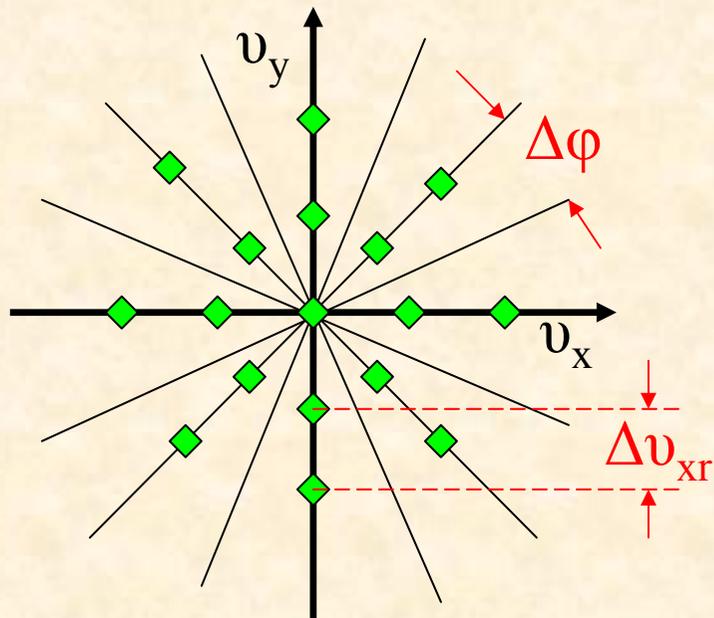
PROYECCIÓN



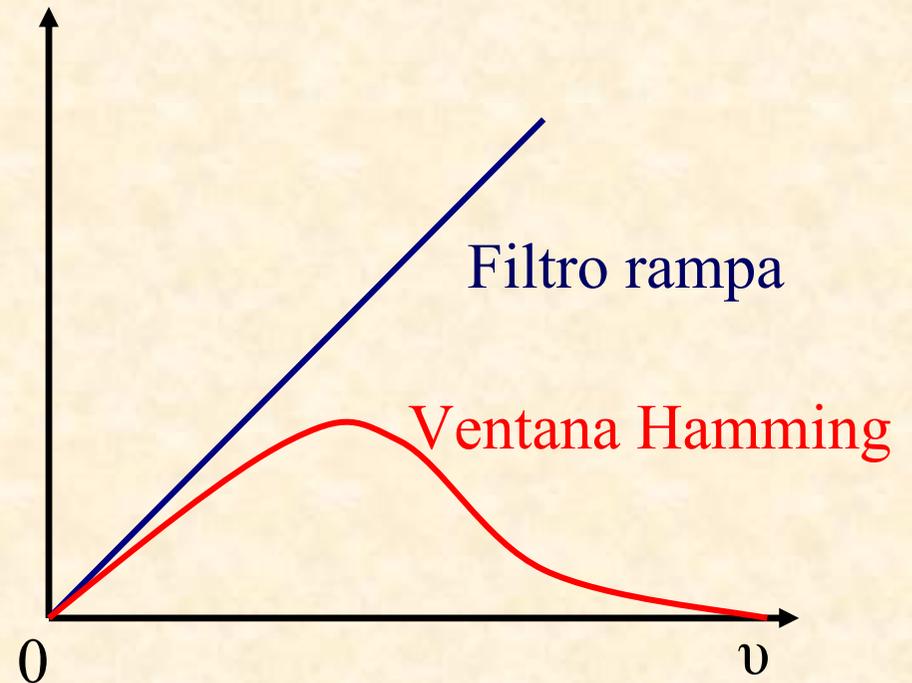
RETROPROYECCIÓN

Filtros

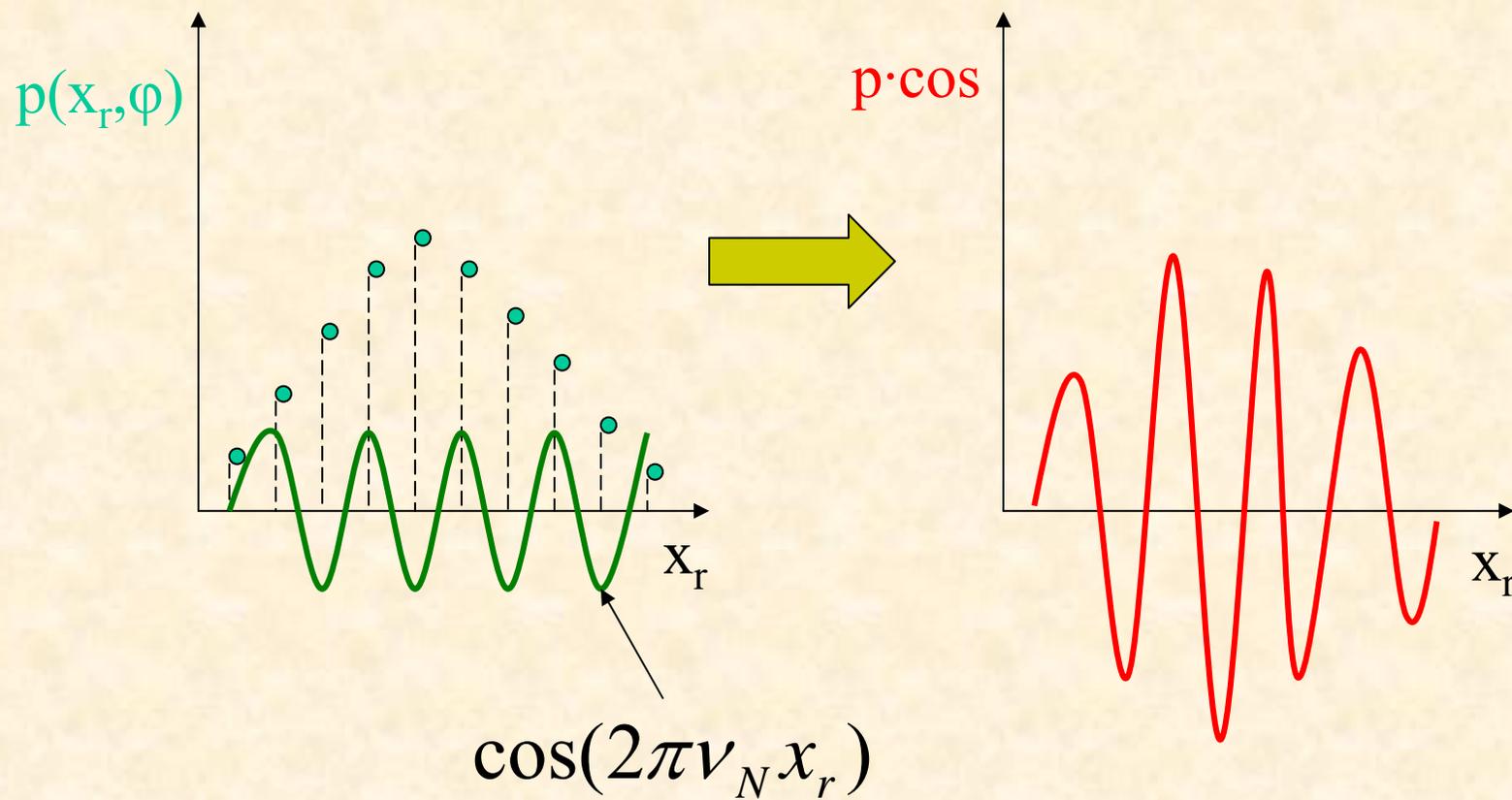
Sobremuestreo en el origen de frecuencias



Tipos de Filtros



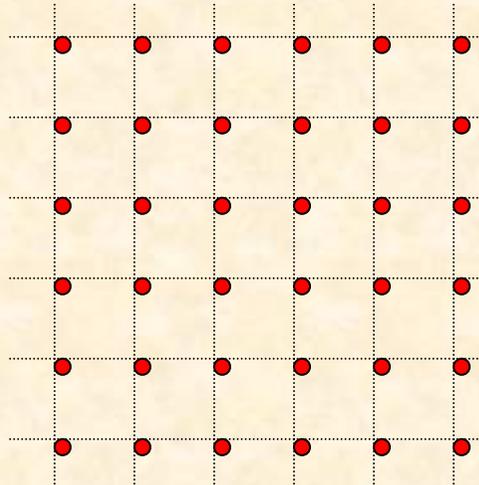
Frecuencia de Nyquist



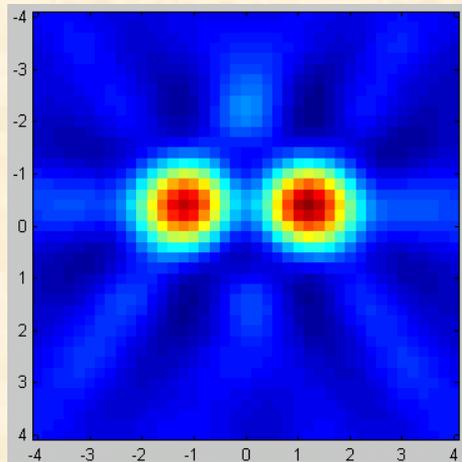
Implementación

$$f(x, y) = \int_0^\pi \left[\int_{-\infty}^{+\infty} dv_{x_r} e^{2\pi i v_{x_r} x_r} |v_{x_r}| W(v_{x_r}) \left(\int_{-\infty}^{+\infty} dx_r e^{-2\pi i v_{x_r} x_r} p(x_r, \phi) \right) \right] d\phi$$

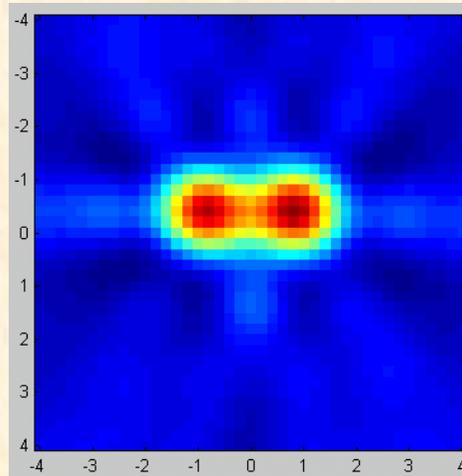
$x_r = x \cdot \cos\phi + y \cdot \sin\phi$



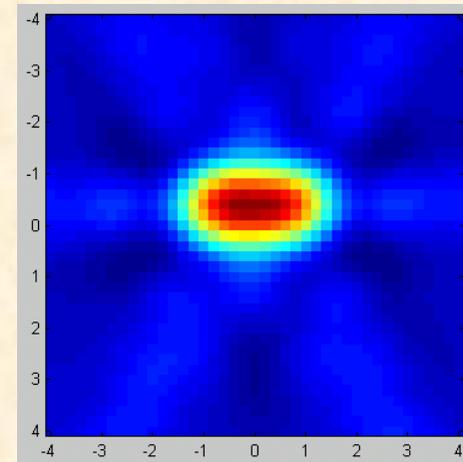
Resolución



6 mm

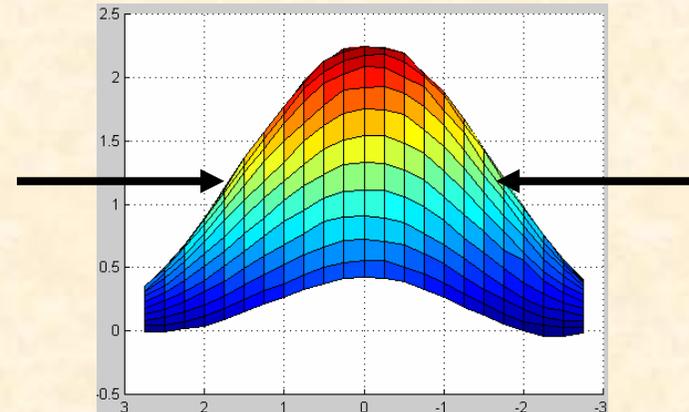
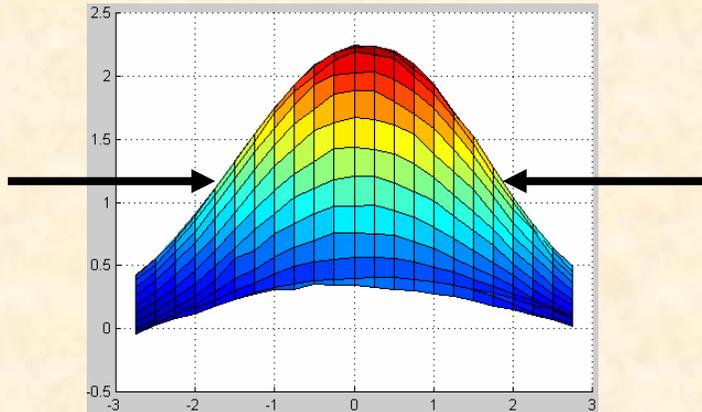
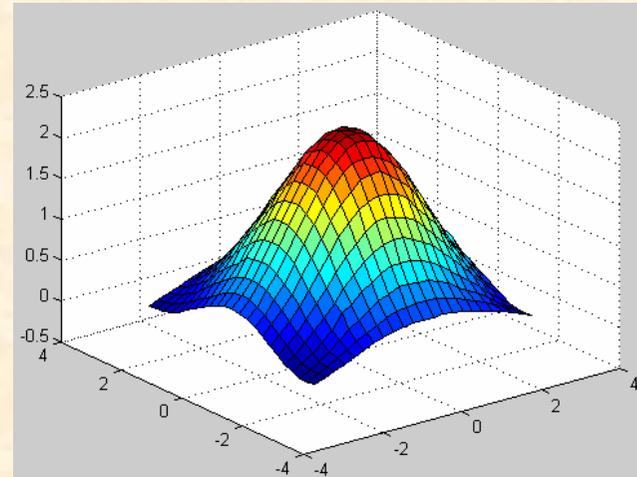
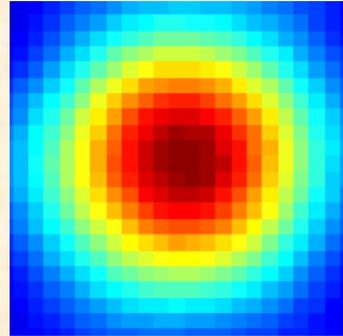


4 mm



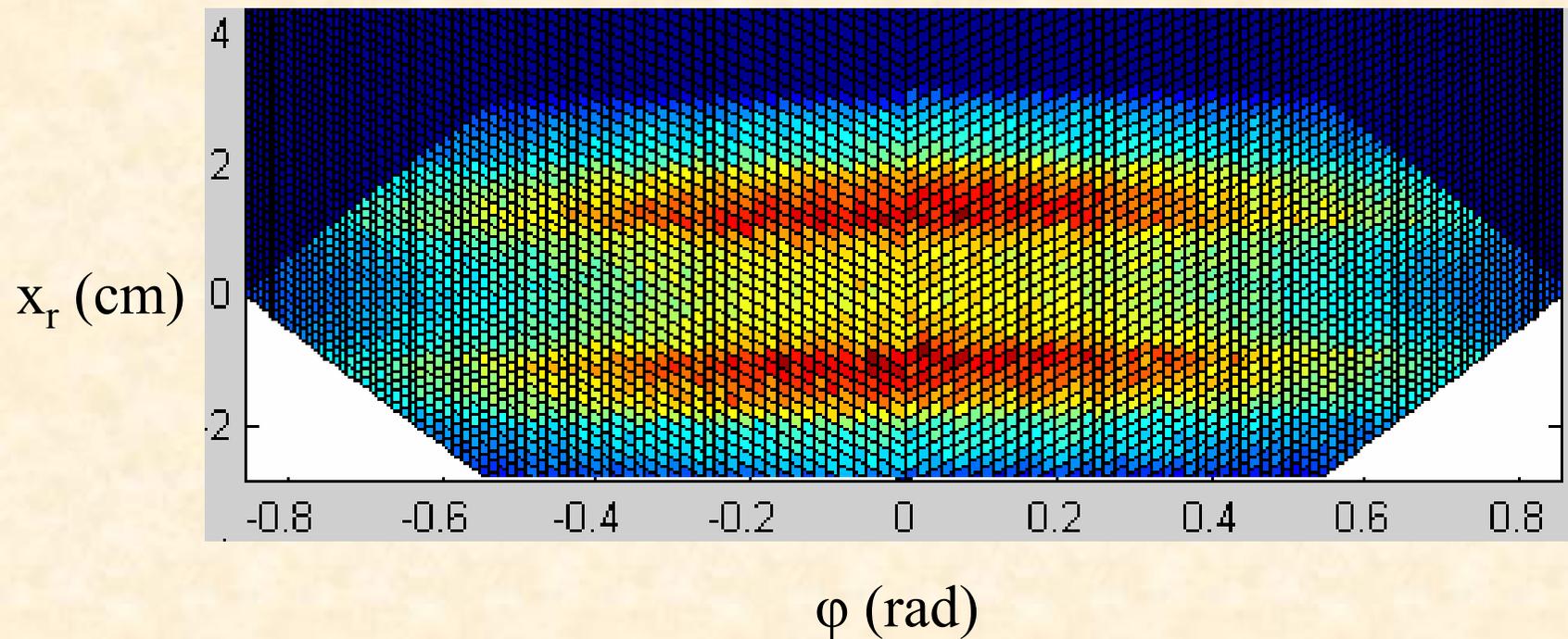
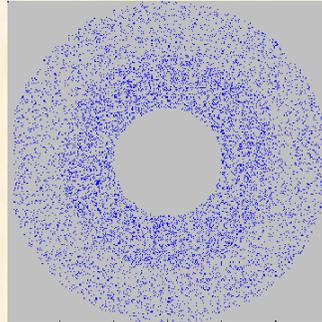
3 mm

Resolución

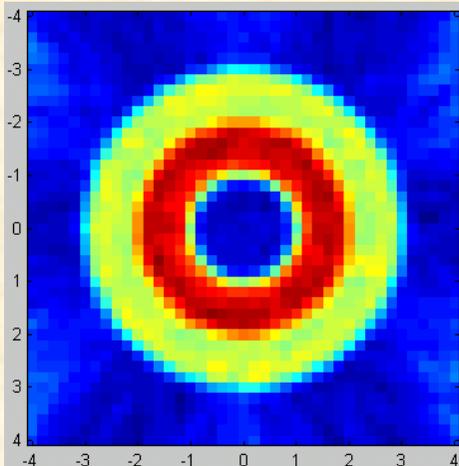
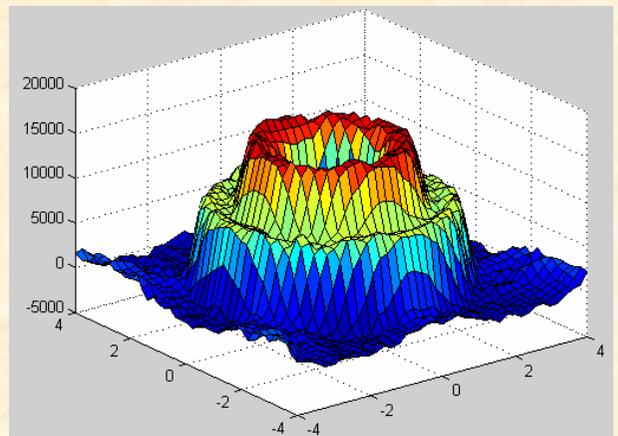
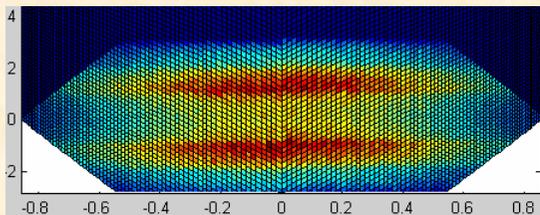
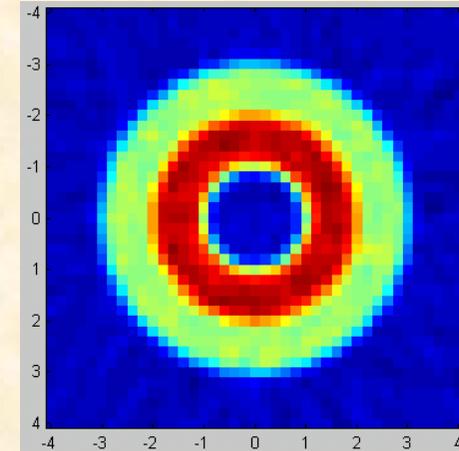
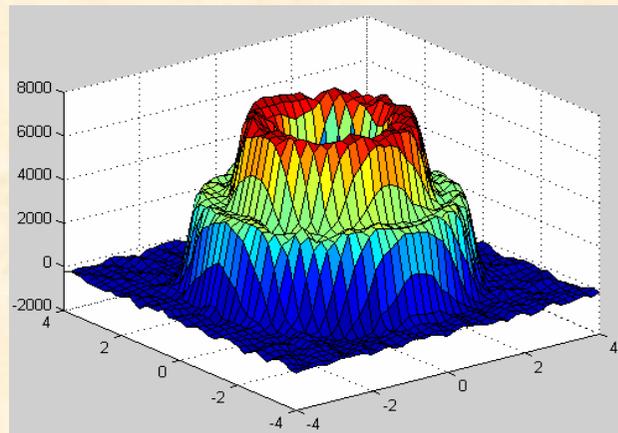
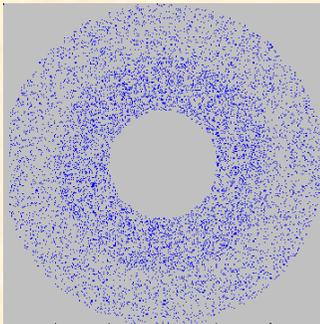


FWHM \approx 3 mm

Imágenes Obtenidas



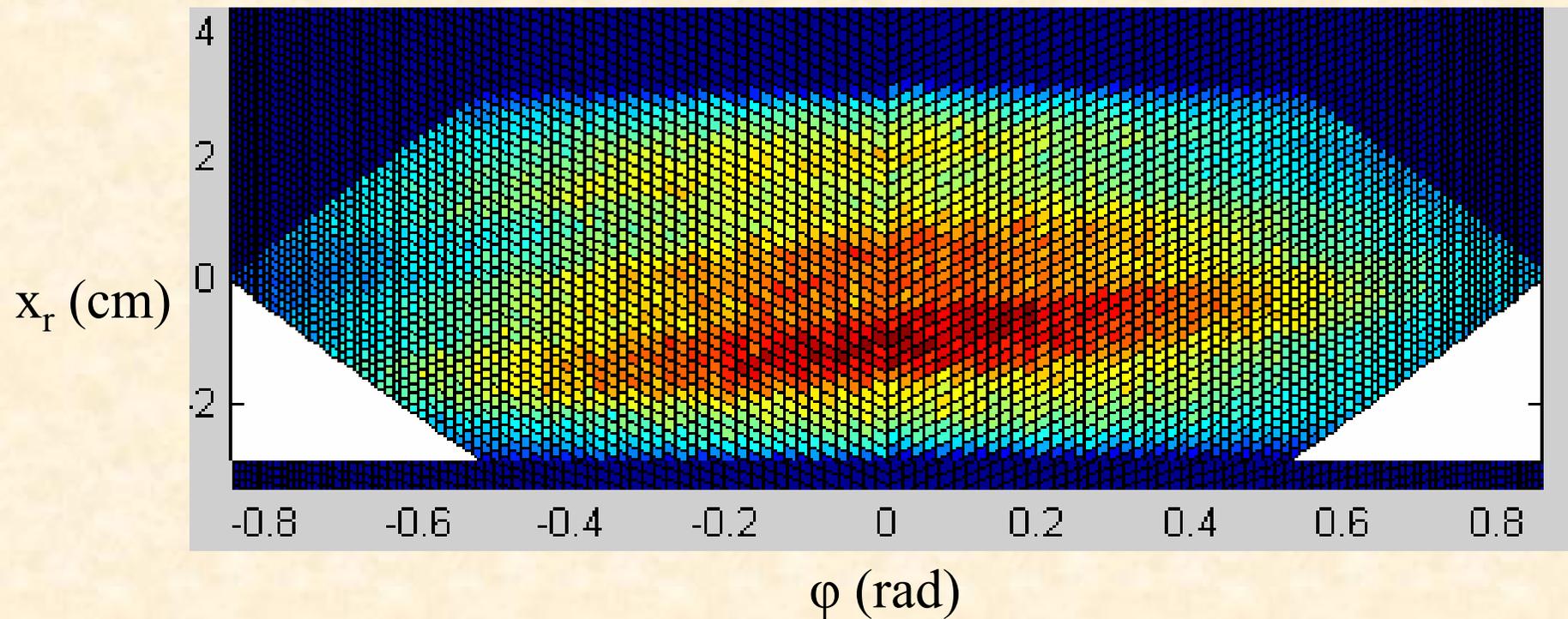
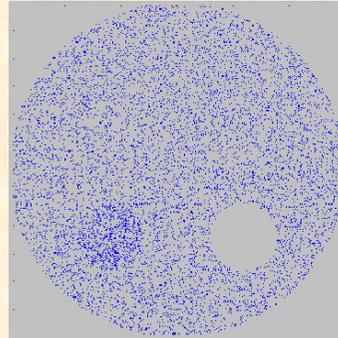
Imágenes Obtenidas



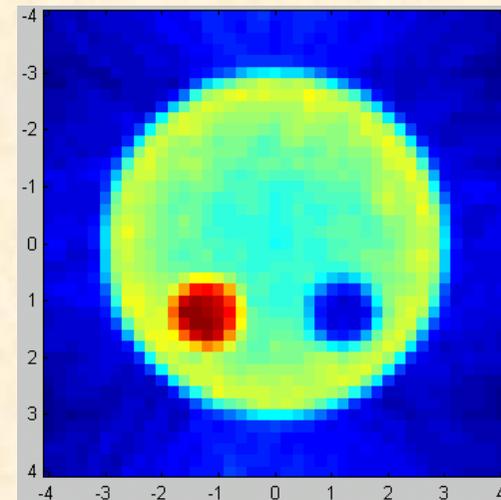
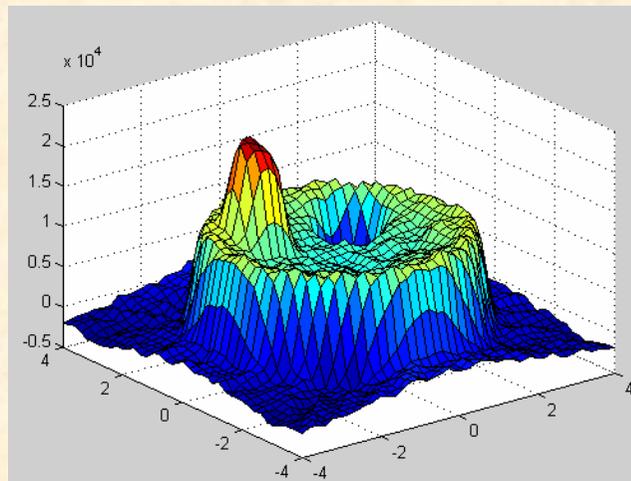
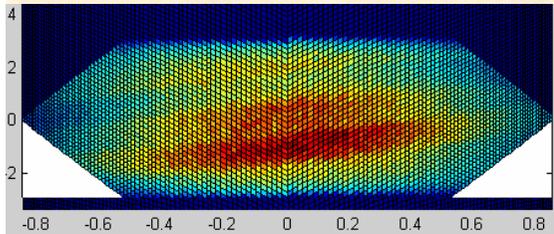
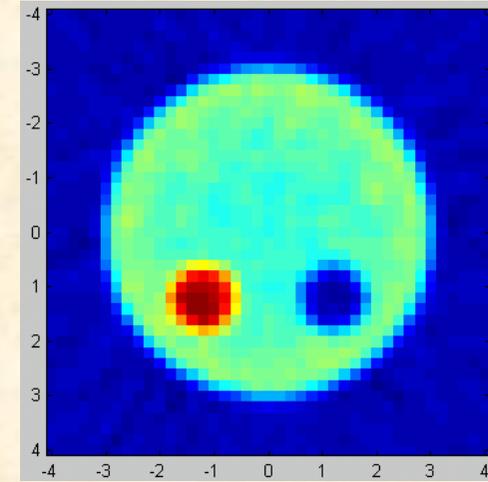
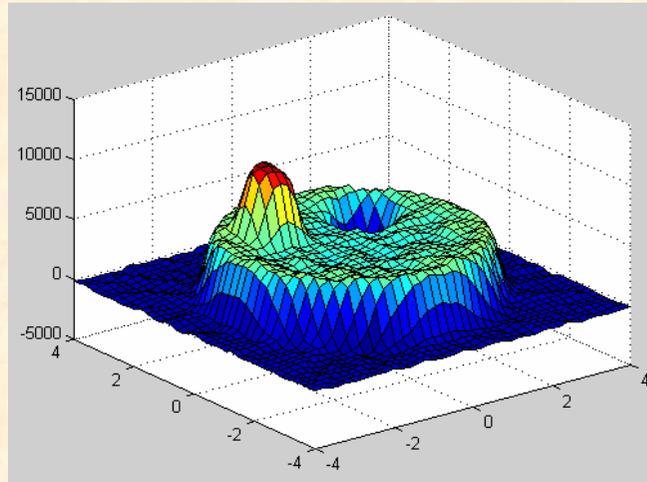
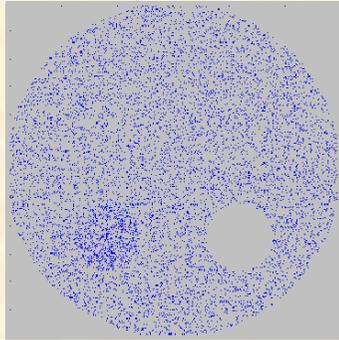
CORREGIDA
POR
NORMALIZACIÓN



Imágenes Obtenidas



Imágenes Obtenidas



CORREGIDA
POR
NORMALIZACIÓN



CONCLUSIONES:

- **Simulación de la Emisión y Detección de Gammas en P.E.T.**
- **Reconstrucción de Imágenes con FBP en Modo 2D.**
- **Estudios Realizados: Resolución, Normalización, Filtros.**

Colaborador Virtual

