Sveučilište u Zagrebu
Prirodoslovno – matematički fakultet
Fizički odsjek

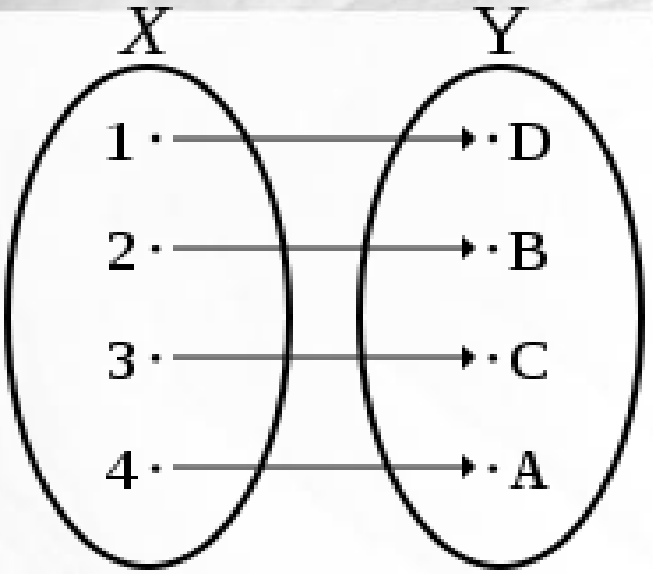
Fizika u medicinskoj dijagnostici

Danijel Cmrk

$$f(\alpha, \beta)$$

$$h(x, y)$$

$$h_1(x, y) = g(x, y, \alpha', \beta', f_1(\alpha, \beta)$$



$$h_2(x, y) = g(x, y, \alpha', \beta', f_2(\alpha, \beta)$$

$$h_1(x, y) + h_2(x, y) = g(x, y, \alpha', \beta')[f_1(\alpha', \beta') + f_2(\alpha', \beta')]$$

$$h(x, y) = h_1(x, y) + h_2(x, y)$$

$$h(x, y) = \int \int g(x, y, \alpha, \beta, f(\alpha, \beta))d\alpha d\beta$$

$$h(x, y) = \int g_1(x - a)f(\alpha, \beta)d\alpha \int g_2(y - \beta)f(\alpha, \beta)d\beta$$

$$I_{kost} = I_0 e^{-\mu_{kost} d}$$

$$I_{tkivo} = I_0 e^{-\mu_{tkivo} d}$$

$$I_\Phi(x') = I_{0,\Phi}(x') e^{-\sum \mu_i \Delta y'}$$

$$\lambda_\Phi(x') = -ln \frac{I_\Phi(x')}{I_{0,\Phi}} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \mu(x,y) \delta(x cos\Phi + y sin\Phi - x') dx dy$$

$$\mu^*(x,y) = \sum_j \lambda_{\Phi_j}(x cos\Phi_j + y sin\Phi_j, \Phi_j) \Delta\Phi_j$$

Dobivanje podataka iz mjerenja

$$F[\lambda_\Phi(x,y)] = \Lambda_\Phi(\nu_x,\nu_y) \qquad F^{-1}[\Lambda_\Phi(\nu_x,\nu_y)] = \lambda_\Phi(x,y)$$

$$F[\mu(x,y)] = M(\nu_x,\nu_y) \qquad F^{-1}[M(\nu_x,\nu_y)] = \mu(x,y)$$

$$\lambda_0(x') = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \mu(x,y)\delta(x-x')dxdy$$

$$\lambda_0(x) = \int_{-\infty}^{\infty} \mu(x,y)dy$$

$$\Lambda_0(\nu_x) = \int_{-\infty}^{\infty} \lambda_0(x)e^{-2\pi i\nu_x x}dx$$

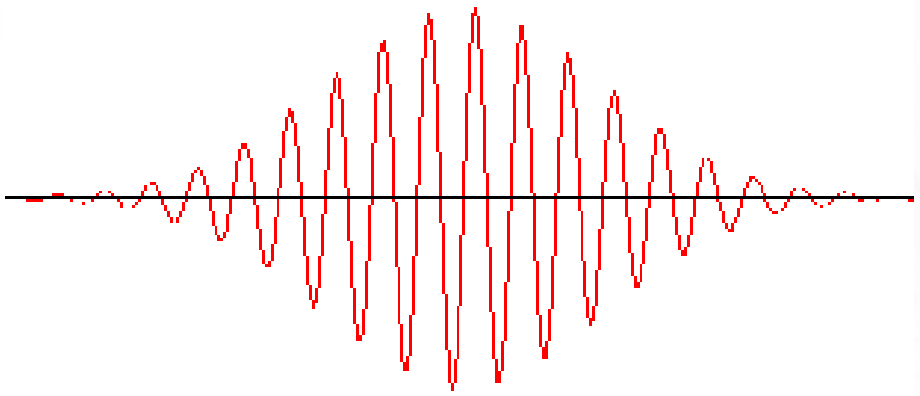
$$\Lambda_0(\nu_x) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \mu(x,y)e^{-2\pi i(\nu_x x+\nu_y y)}dxdy|_{\nu_y=0} = M(\nu_x,0)$$

$$\Lambda_\Phi(\nu'_x) = M'(\nu'_x,\nu'_y) = M^P(\nu,\Phi)$$

Metode reprojekcije

$$\mu^P(r,\theta) = \mu(x,y) = \int\int M'(\nu'_x,\nu'_y)e^{2\pi i(\nu_x x+\nu_y y)}dxdy$$

$$\mu(x,y) = \int_0^{\pi}\int_0^{\infty} M^P(\nu,\Phi)e^{2\pi i\nu(xcos\Phi+ysin\Phi)}|\nu|d\nu d\Phi$$



$$P_{SL} = \frac{2\nu_{max}}{\pi} sin\frac{\pi v}{2\nu_{max}}$$

$$s = \frac{1}{2\nu_{max}}$$

$$p_{SL}(ms) = -\frac{2}{(\pi s)^2}\frac{1}{4m^2-1}$$

Kompjuterizirana tomografija (CT)

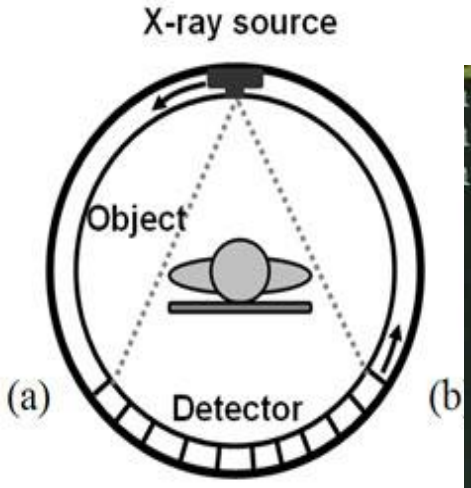
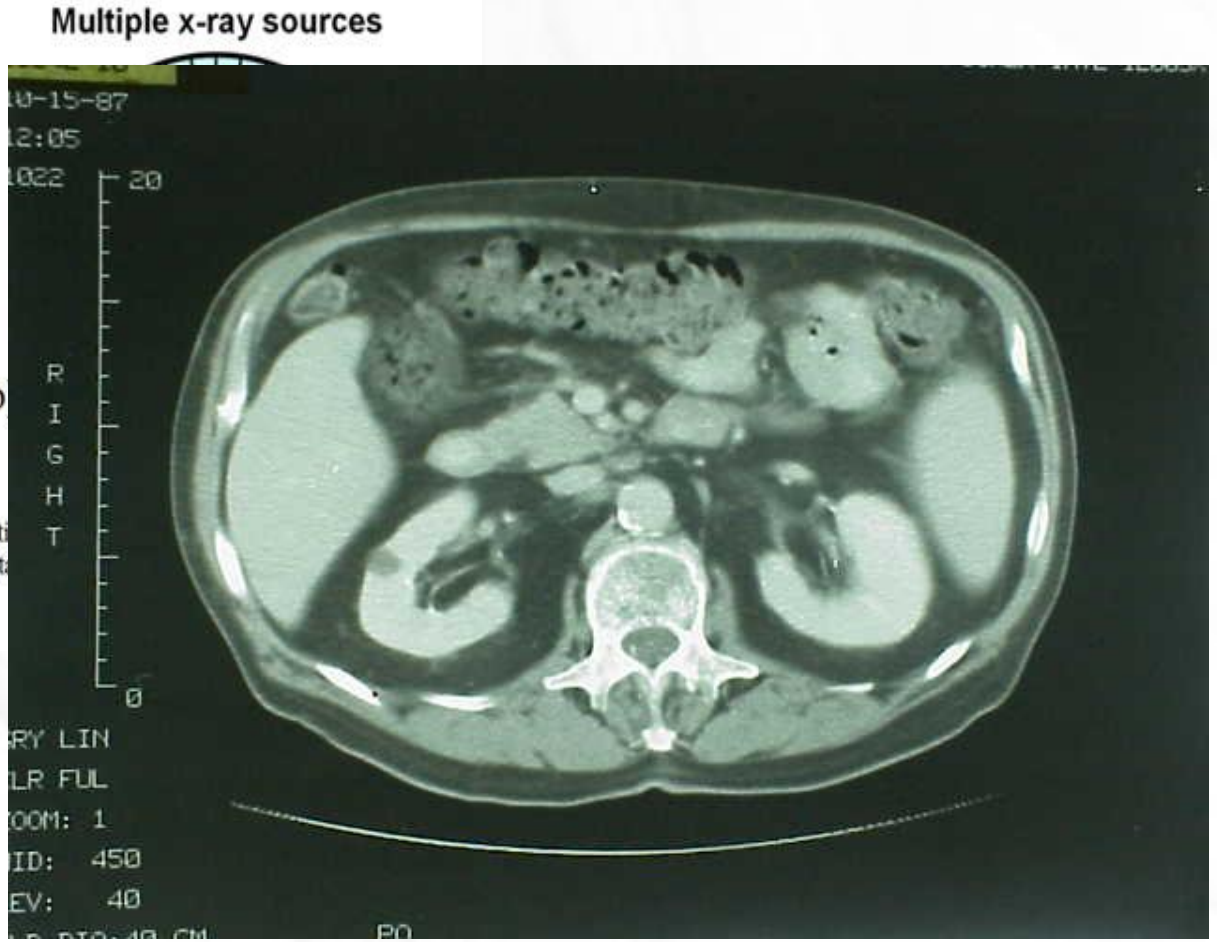
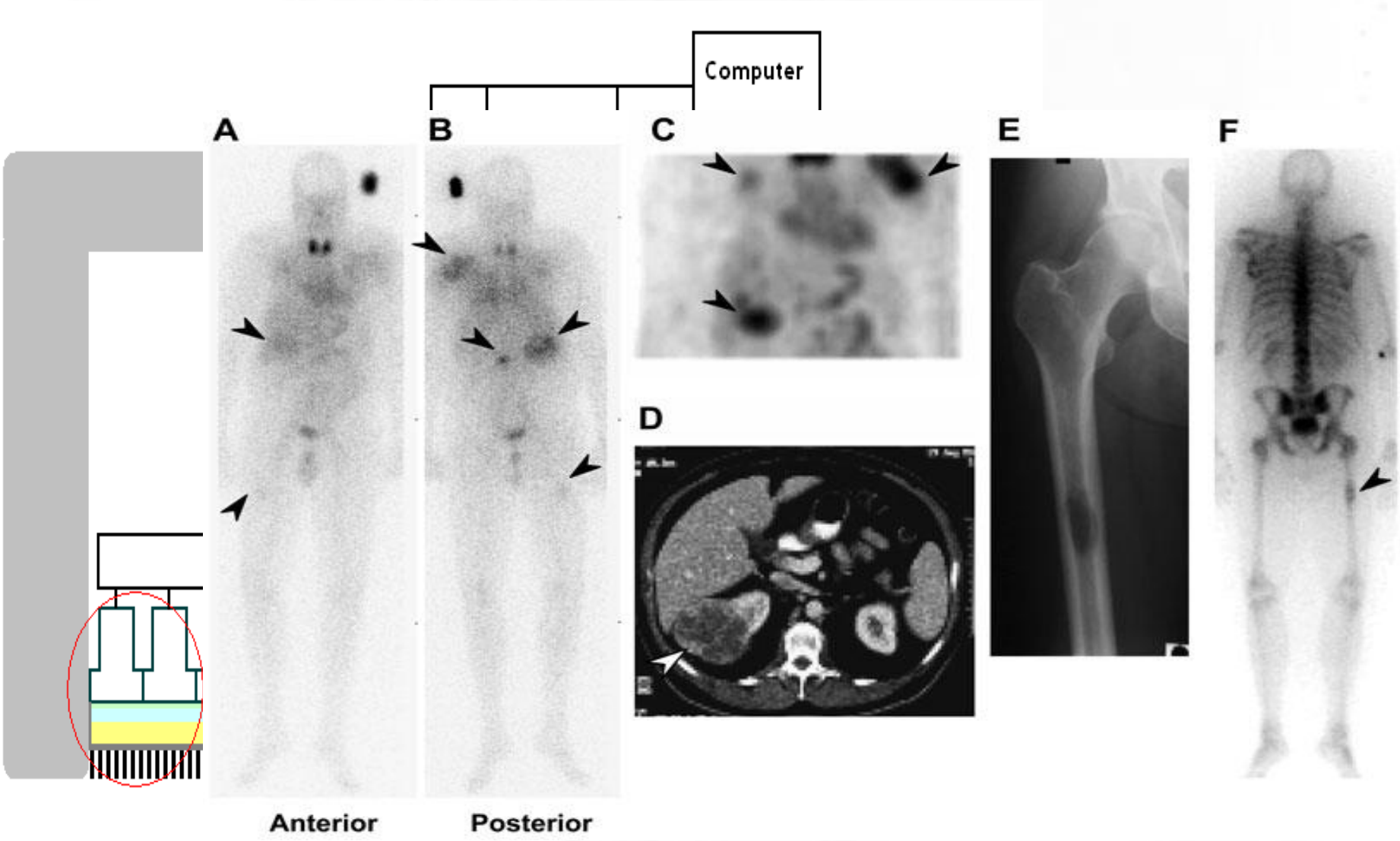


Figure 1: (a) Configuration of the conventi
multiplexing CT scanner enables simult
images due to the multiplexing principle.



Gama kamera



Popis radinukleotida

isotope	symbol	Z	$T_{1/2}$	decay	photons	β
Imaging:						
fluorine-18	^{18}F	9	110 m	β^+	511 (193%)	0.664 (97%)
gallium-67	^{67}Ga	31	3.26 d	ec	93 (39%), 185 (21%), 300 (17%)	-
krypton-81m	^{81m}Kr	36	13.1 s	IT	190 (68%)	-
rubidium-82	^{82}Rb	37	1.27 m	β^+	511 (191%)	3.379 (95%)
technetium-99m	^{99m}Tc	43	6.01 h	IT	140 (89%)	-
indium-111	^{111}In	49	2.80 d	ec	171 (90%), 245 (94%)	-
iodine-123	^{123}I	53	13.3 h	ec	159 (83%)	-
xenon-133	^{133}Xe	54	5.24 d	β^-	81 (31%)	0.364 (99%)
thalium-201	^{201}Tl	81	3.04 d	ec	69-83* (94%), 167 (10%)	-
Therapy:						
yttrium-90	^{90}Y	39	2.67 d	β^-	-	2.280 (100%)
iodine-131	^{131}I	53	8.02 d	β^-	364 (81%)	0.807 (100%)

Hvala na pažnji