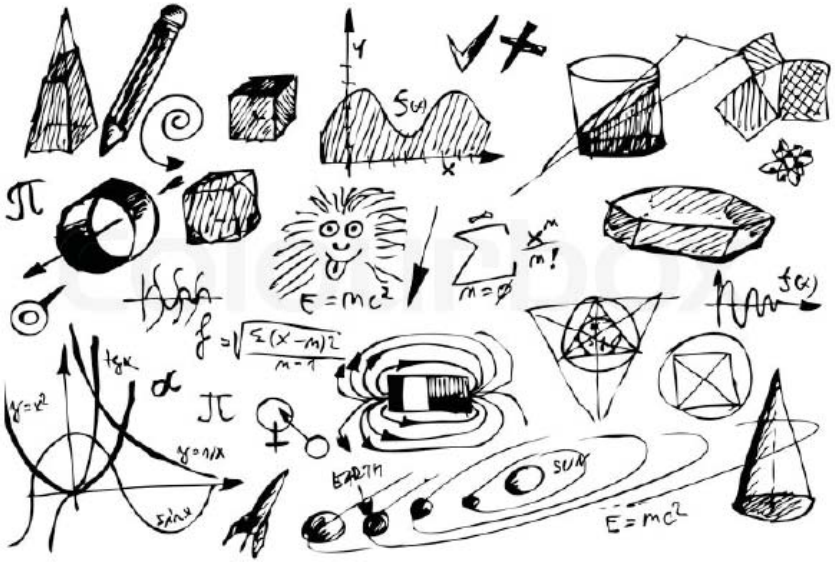


Incontri del Martedì

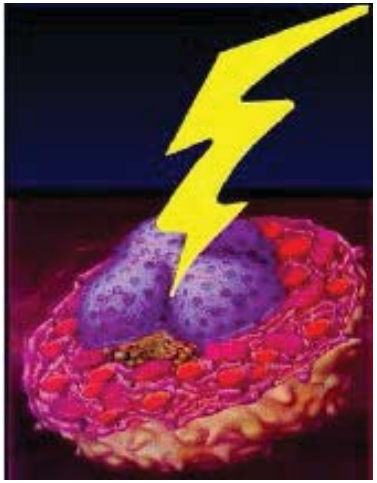
Saverio Altieri
Ian Postuma
Setareh Fatemi

Slow Physics: neutroni lenti e radioterapia

RADIOTERAPIA

radioterapia

sfrutta la capacità delle radiazioni ionizzanti di produrre danni letali nelle cellule tumorali



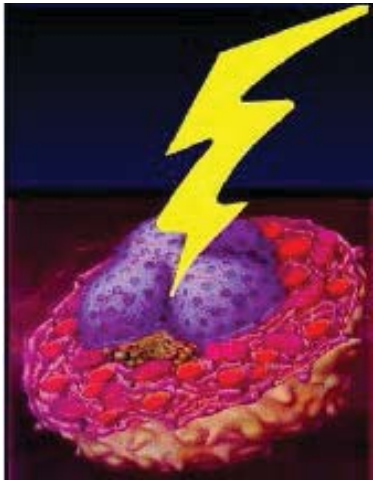
DNA

Uno dei bersagli più sensibili alle radiazioni è il DNA

RADIOTERAPIA

radioterapia

sfrutta la capacità delle radiazioni ionizzanti di produrre danni letali nelle cellule tumorali



selettività

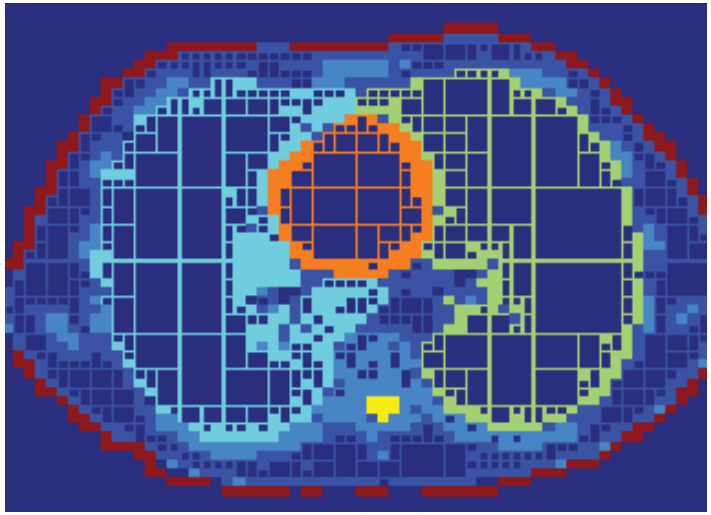
una delle principali caratteristiche di una terapia antitumorale;

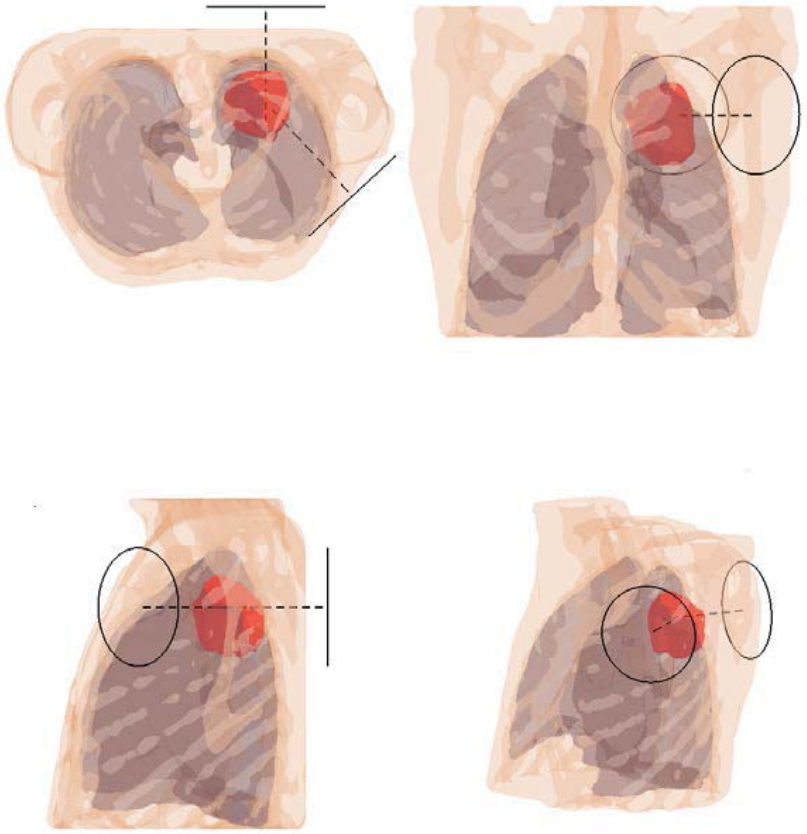
le radiazioni non distinguono le cellule tumorali da quelle sane!

RADIOTERAPIA

Tumori profondi

Come colpire tumori profondi
senza danneggiare i tessuti sani soprastanti?





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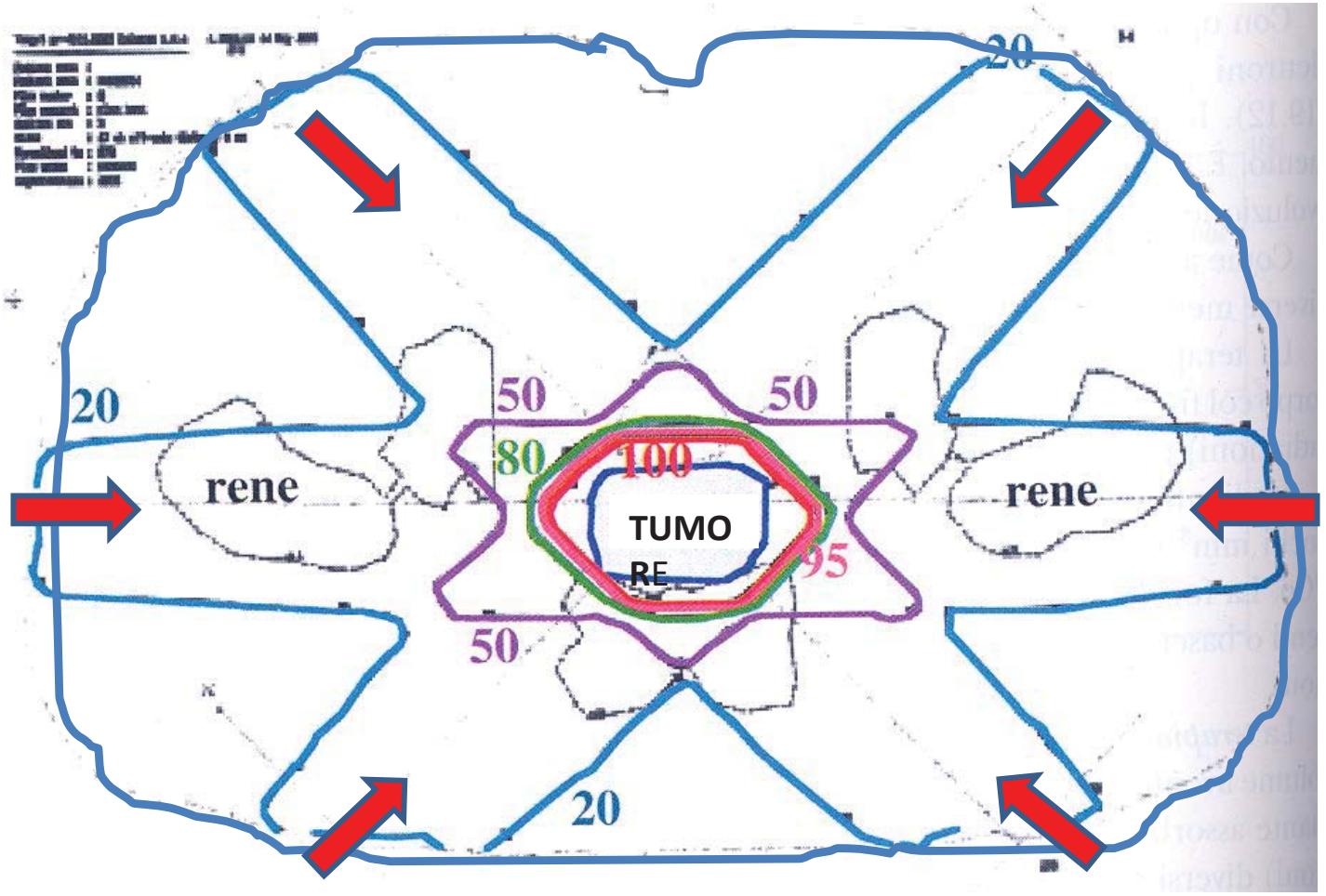
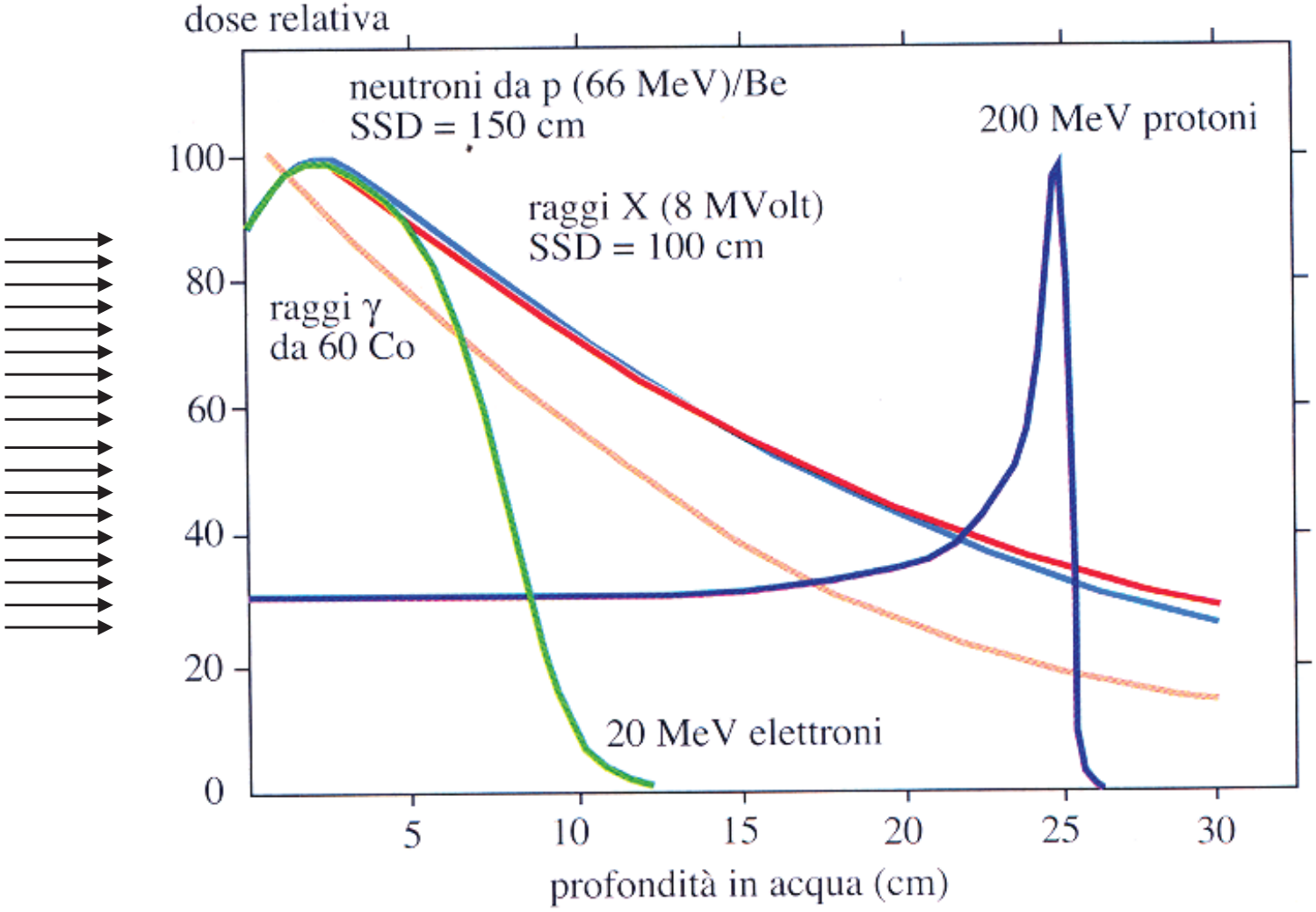


RADIOTERAPIA

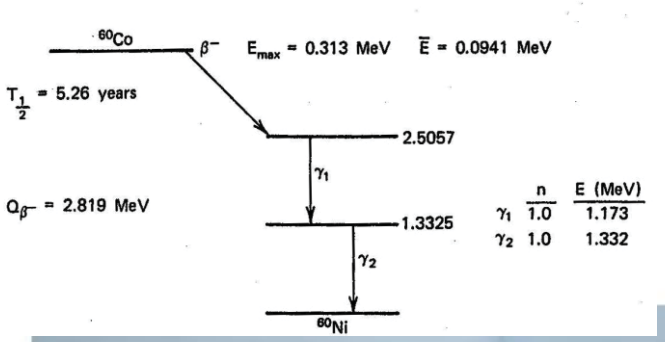
radiazioni usate

Fotoni
Elettroni
Neutroni
Protoni
Ioni carbonio

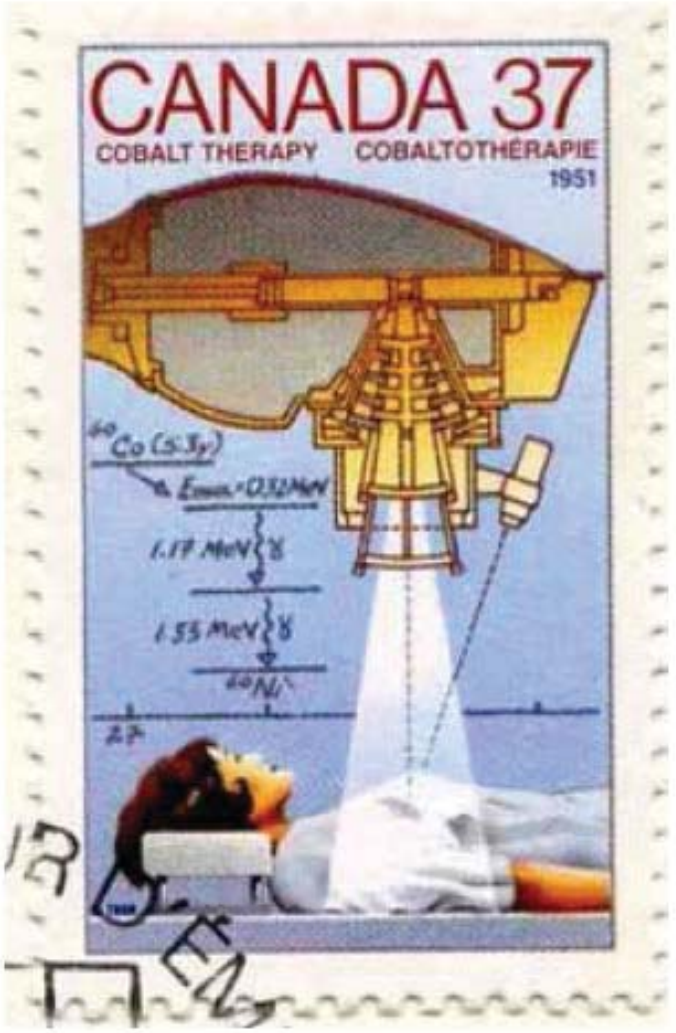
Dose in funzione della profondità



RADIOTERAPIA

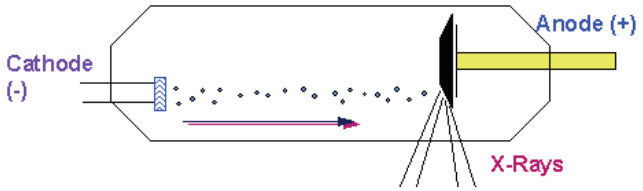


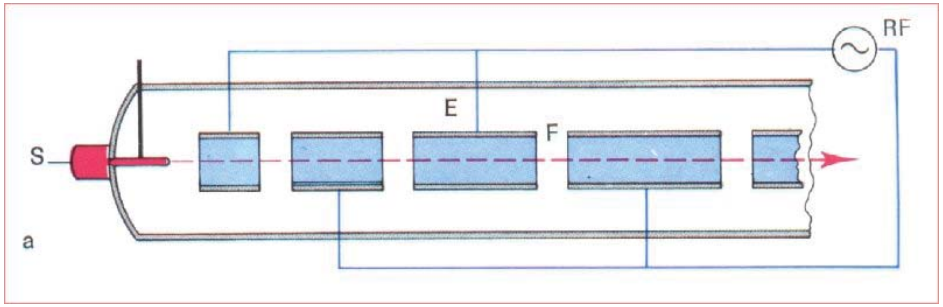
BOMBA AL COBALTO

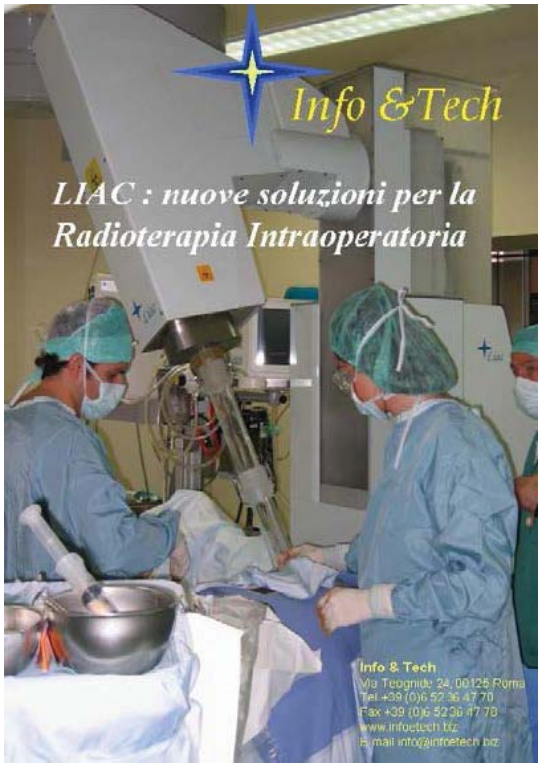


RADIOTERAPIA

ACCELERATORI LINEARI DI ELETTRONI





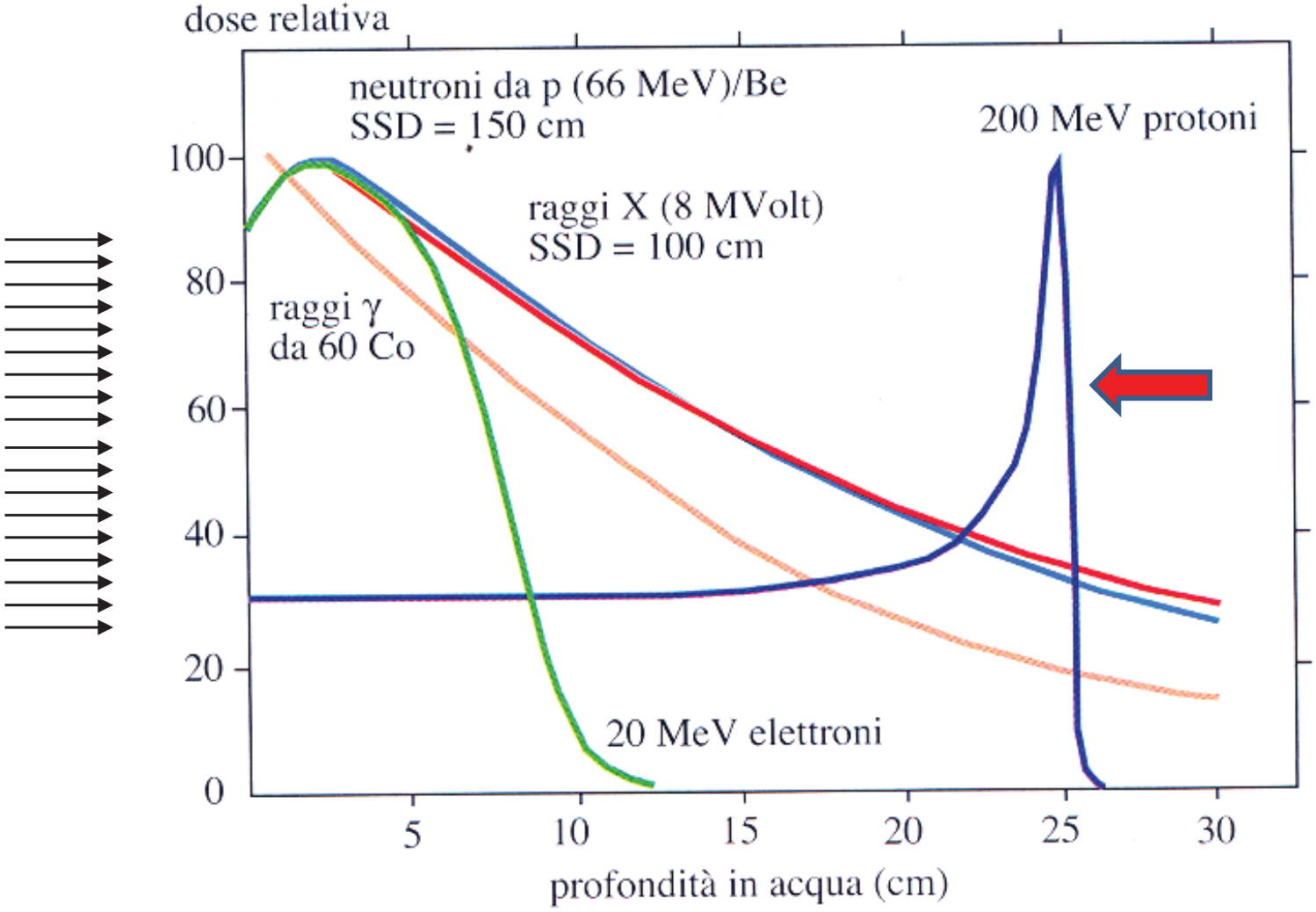


ADROTERAPIA

radiazioni usate

Protoni
Ioni carbonio

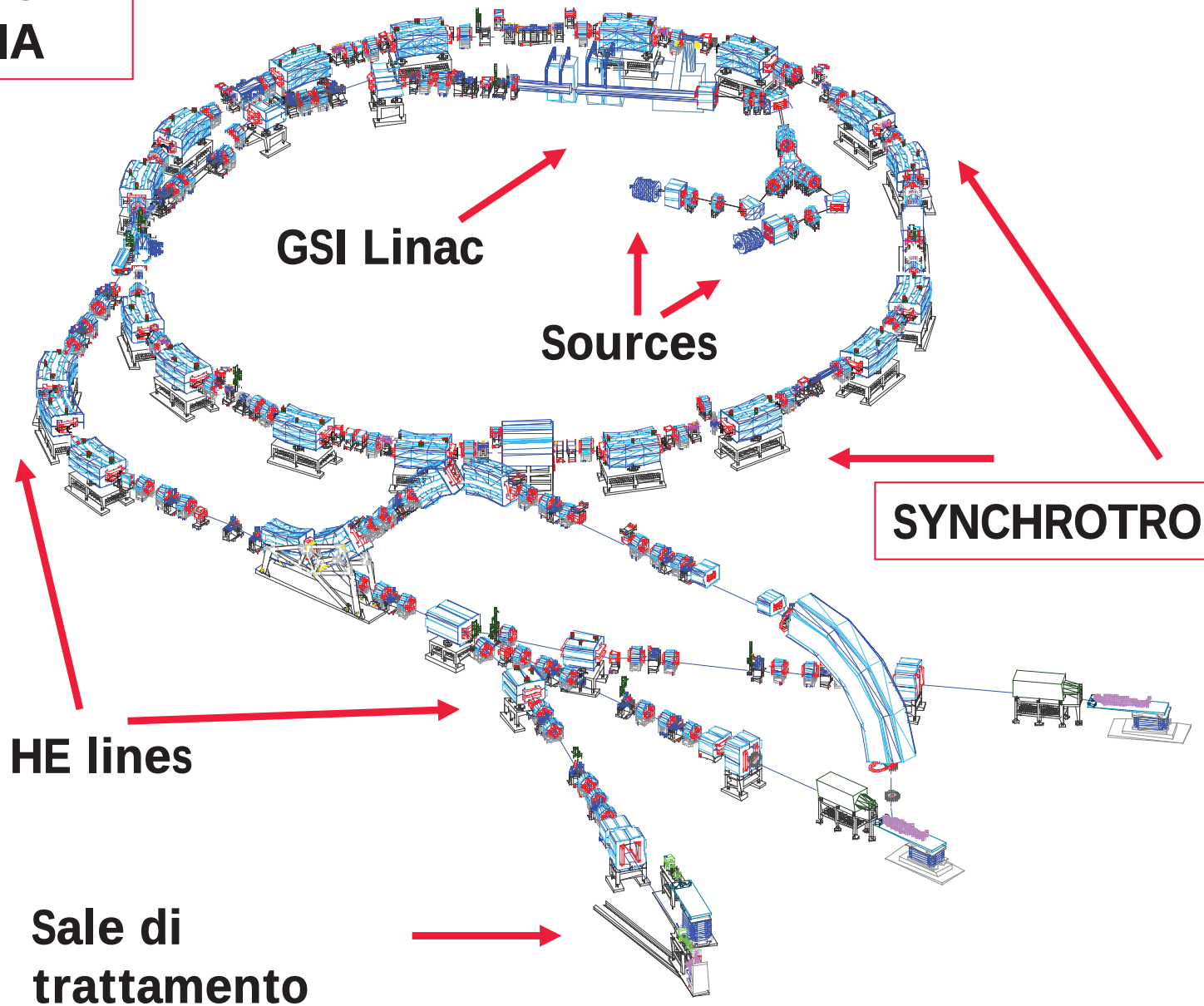
Dose in funzione della profondità



ADROTERAPIA

SINCROTRONE DI PAVIA

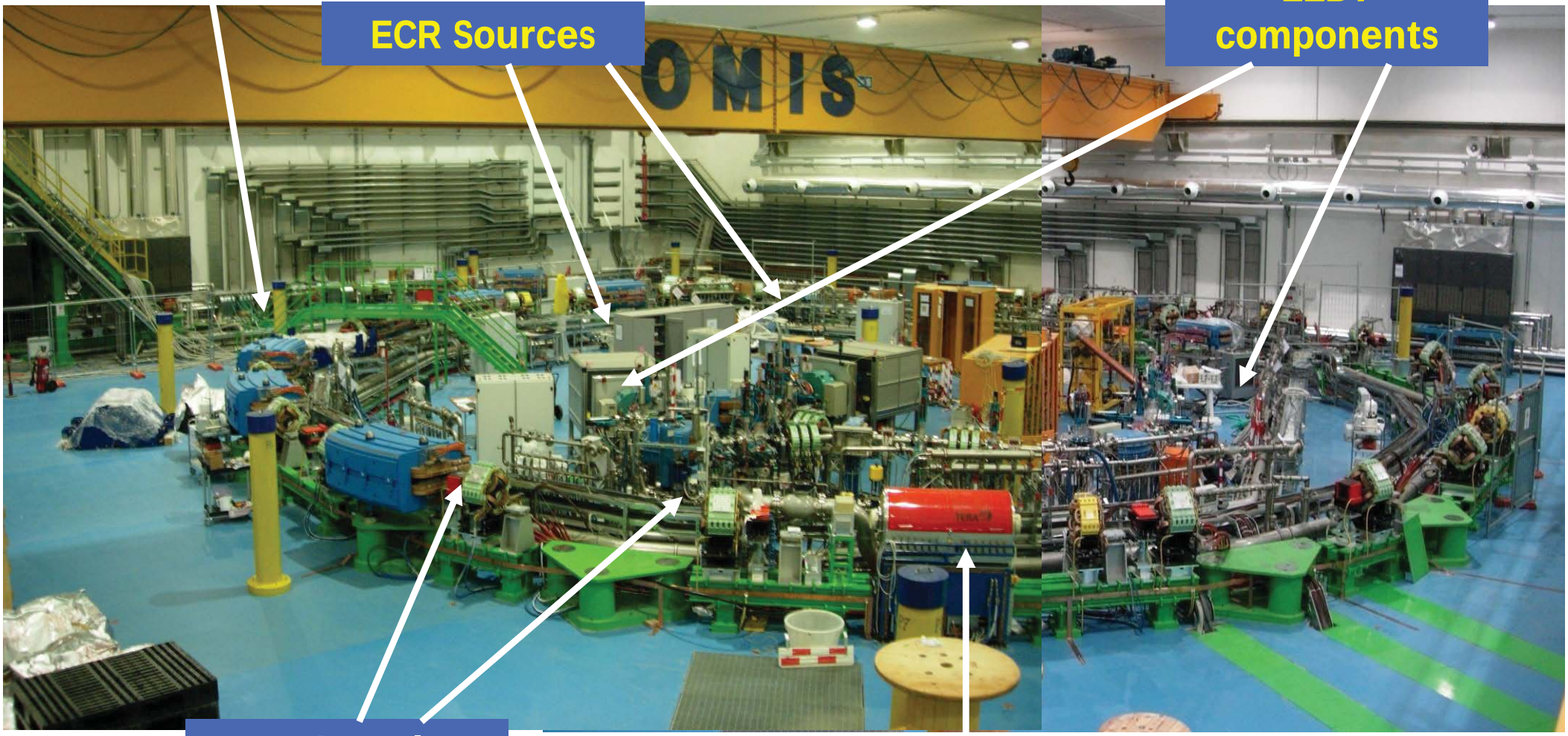
CNAO



ADROTERAPIA

CNAO

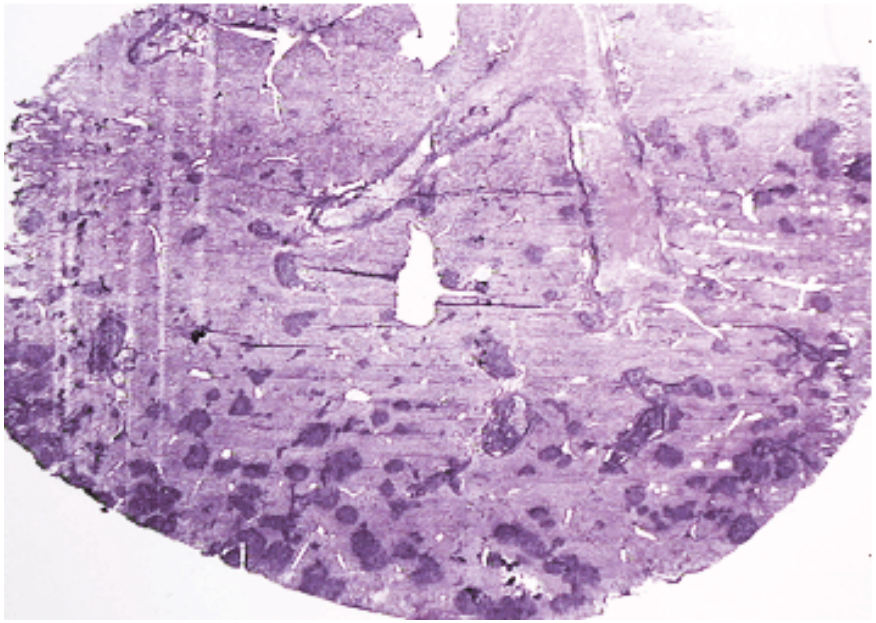
SINCROTRONE DI PAVIA



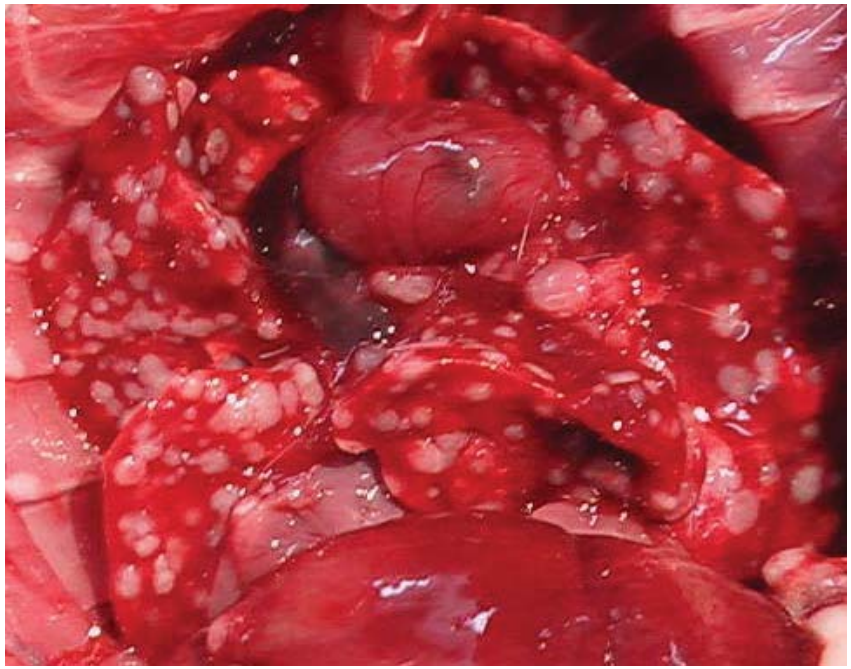
RADIOTERAPIA

Tumori localizzati e tumori diffusi

Metastasi epatiche in ratto



Metastasi polmonari in ratto

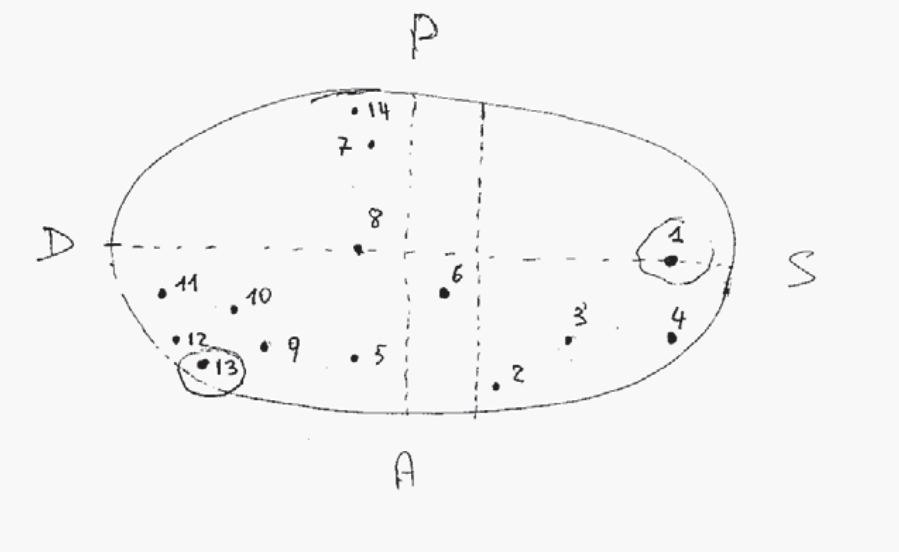


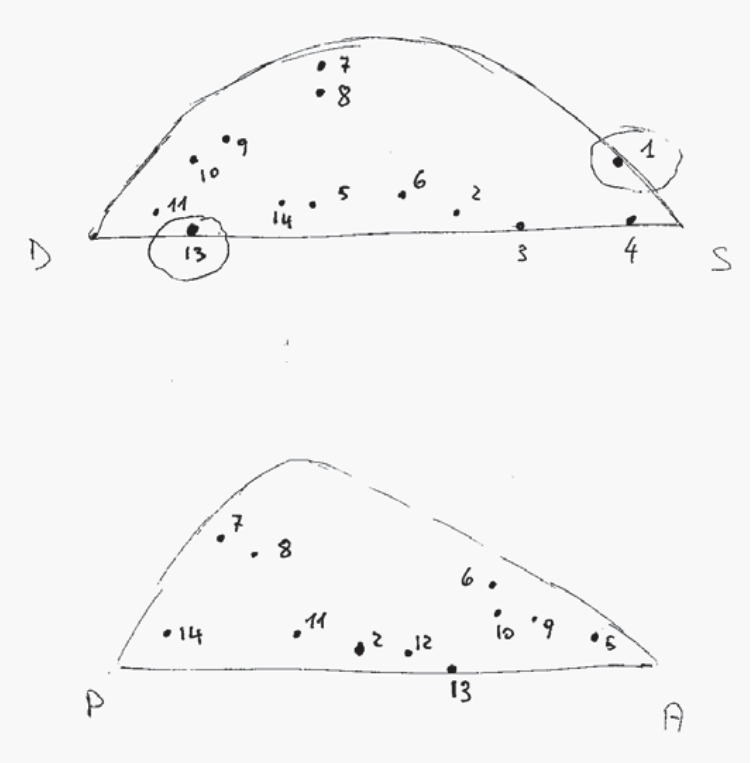
Ma cosa possiamo fare quando un tumore si diffonde
e invade un intero organo vitale?

RADIOTERAPIA

Tumori localizzati e tumori diffusi

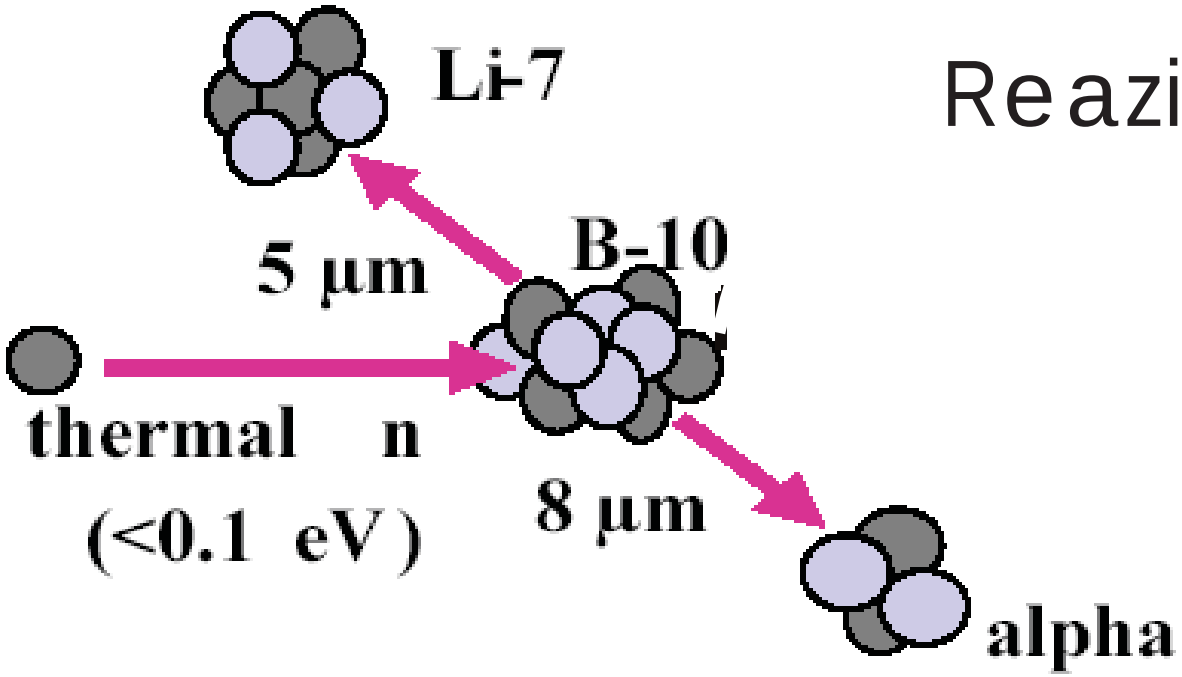
Metastasi epatiche in paziente





Ma cosa possiamo fare quando un tumore si diffonde e invade un intero organo vitale?

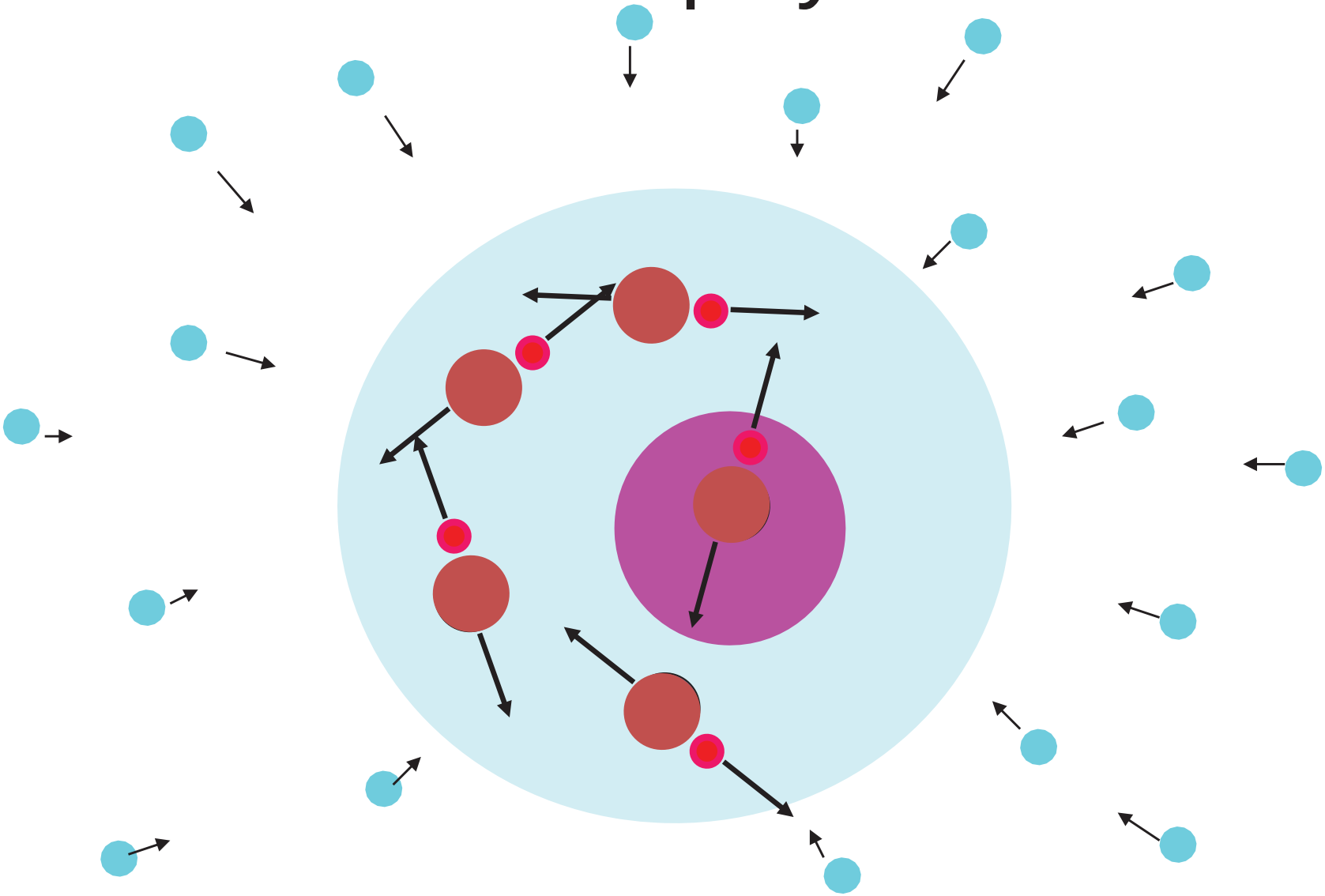
Slow physics



Reazione indotta da neutroni lenti

$$n + {}^{10}B \rightarrow {}^{7}Li + \alpha$$

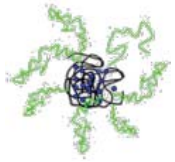
Slow physics



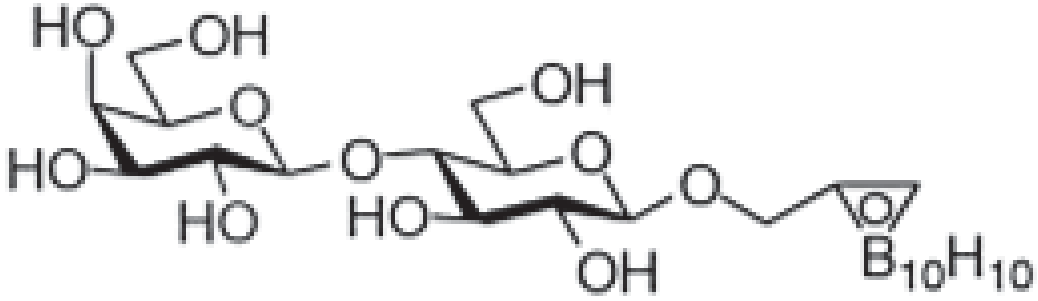
$$n + {}^{10}B \rightarrow {}^{7}Li + \alpha$$

Slow physics

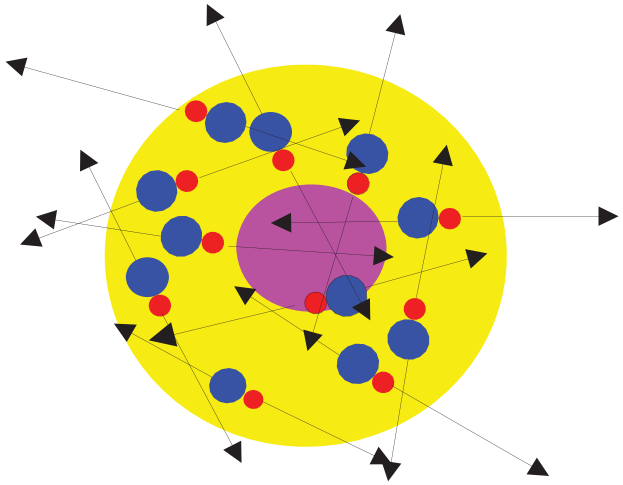
Veicolante

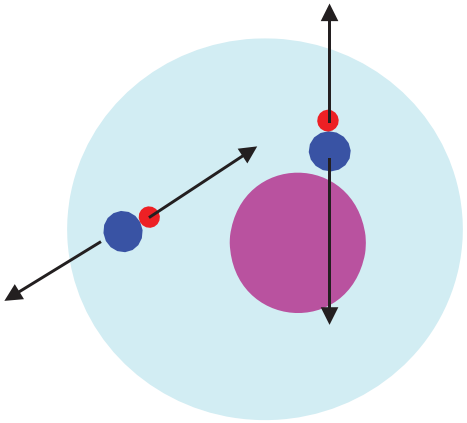


del Boro



$D_T \propto C_T$





$D_S \propto C_S$

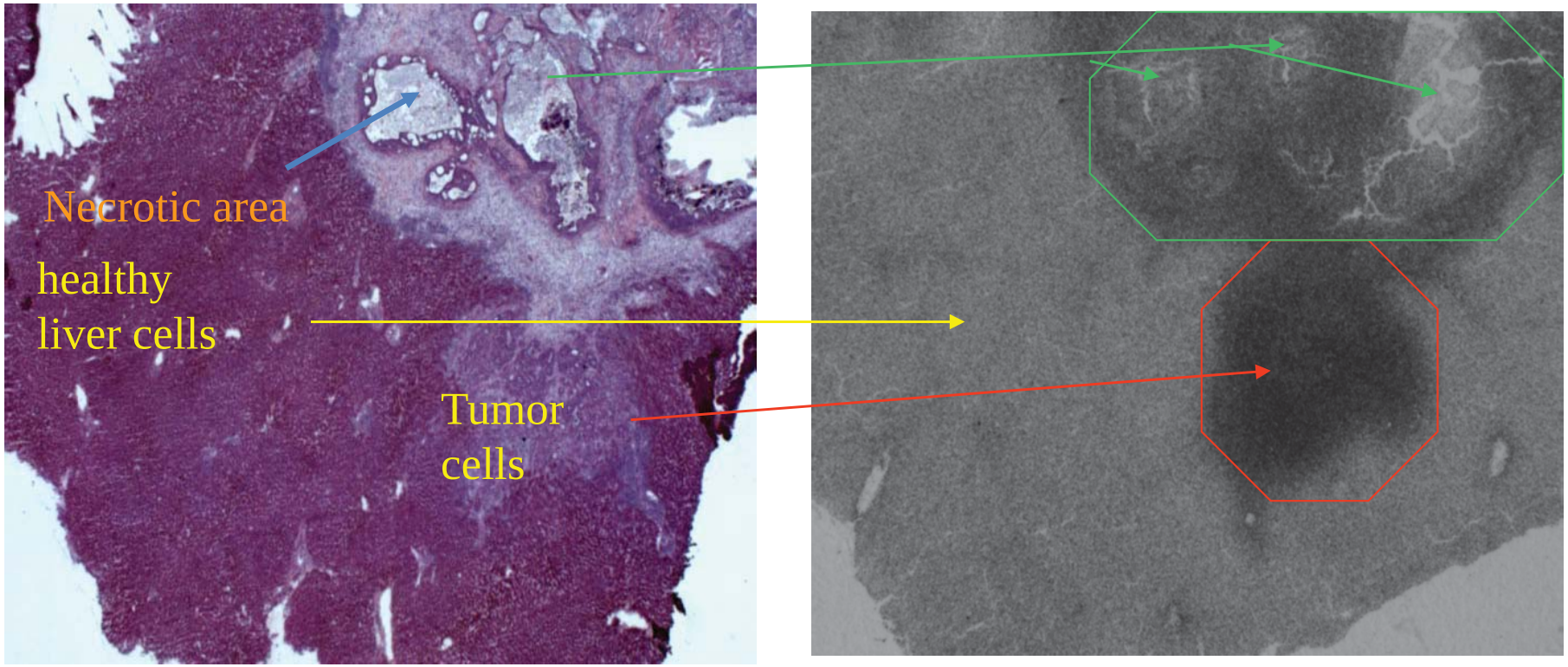
selettività

a livello cellulare

Slow physics

Histology

Neutron autoradiography

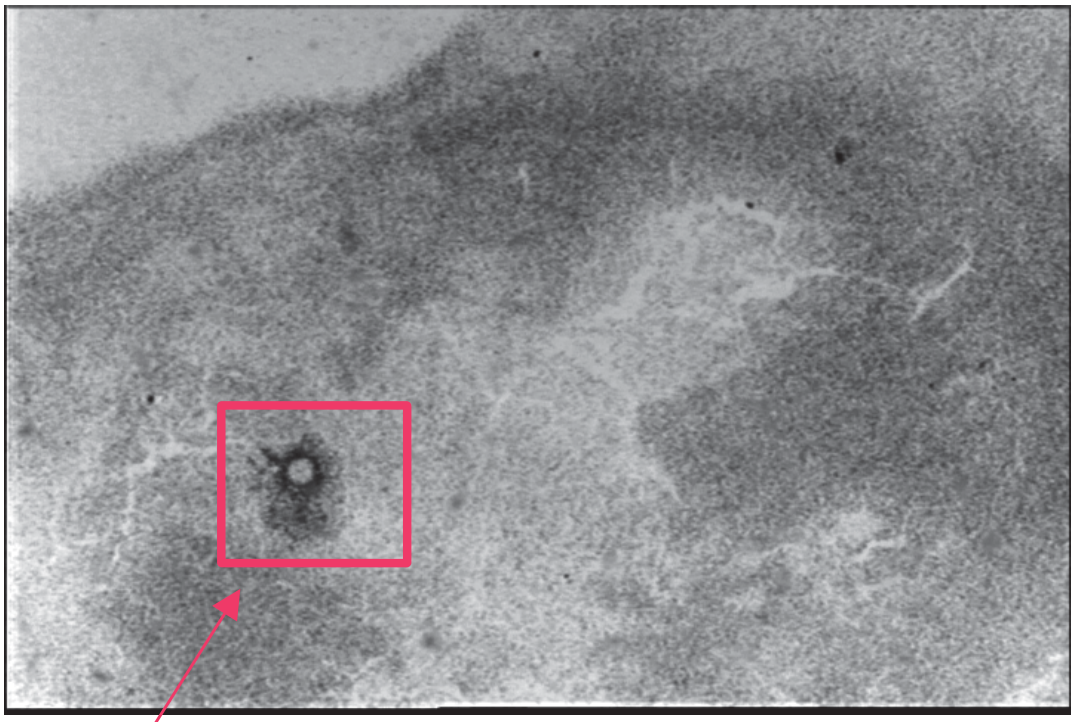


selettività

a livello cellulare

Slow physics

Neutron autoradiography



nodulo tumorale da 0.3 mm

selettività

a livello cellulare

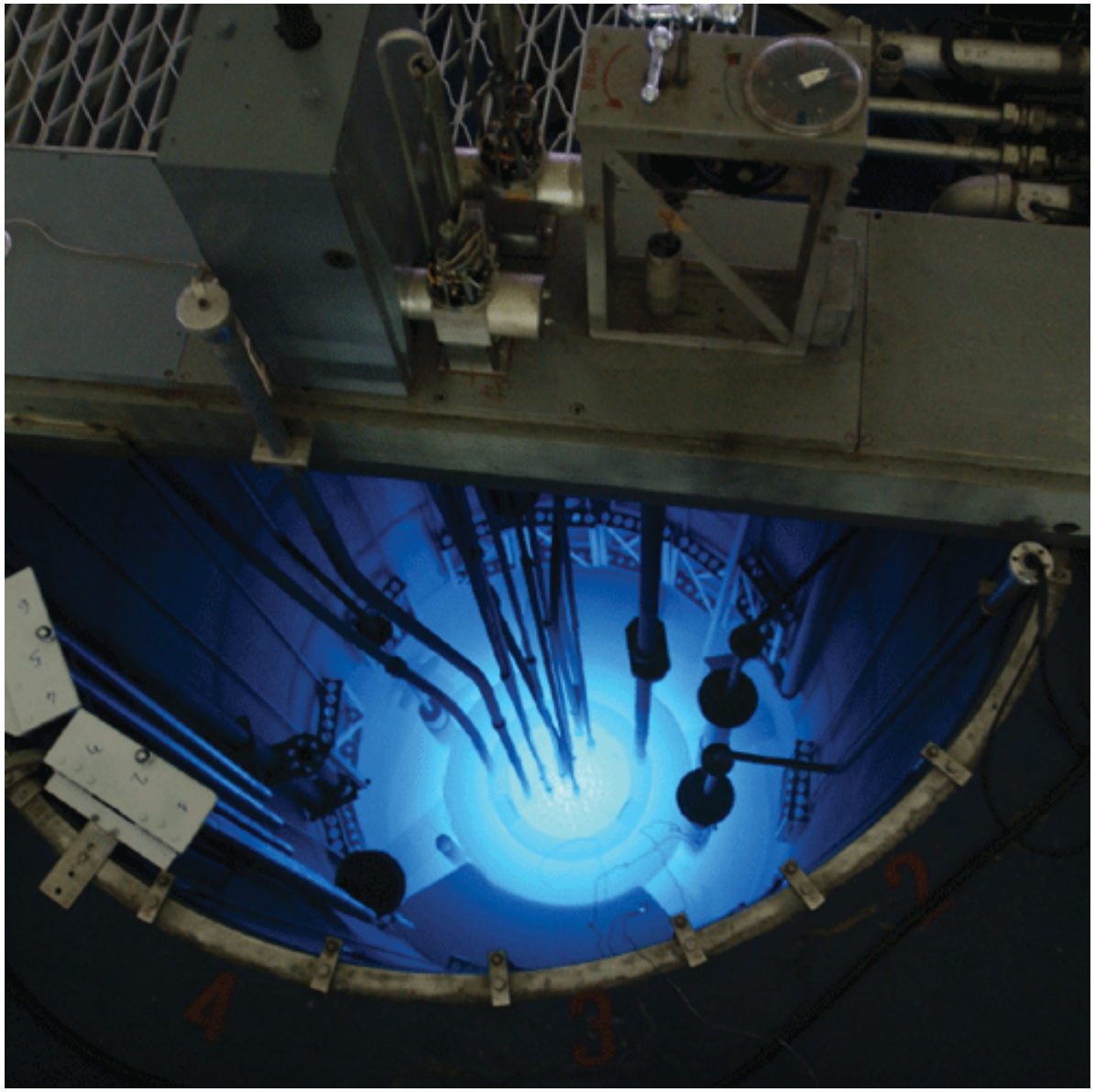
Slow physics

sorgenti di

neutroni lenti

Rattore nucleare

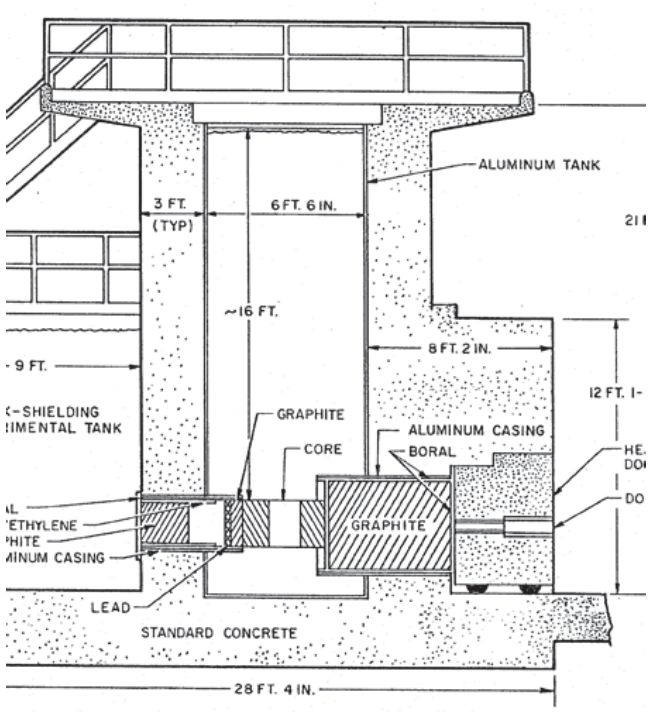
LENA di Pavia



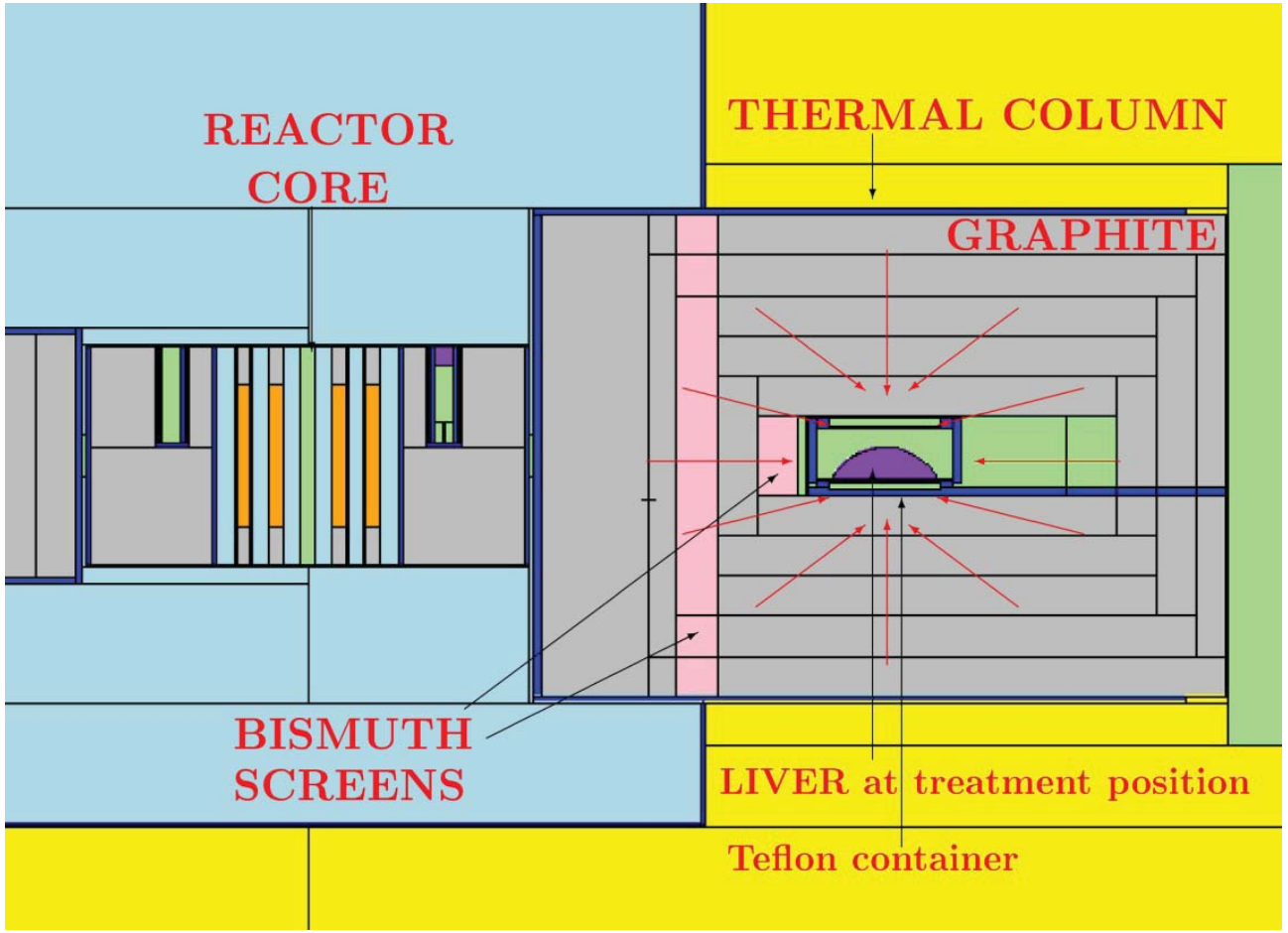
Slow physics

Rattore nucleare

LENA di Pavia



Simulazione Monte Carlo



Slow physics

Espianto

del fegato

Slow physics

irraggiamento

neutronico

Slow physics

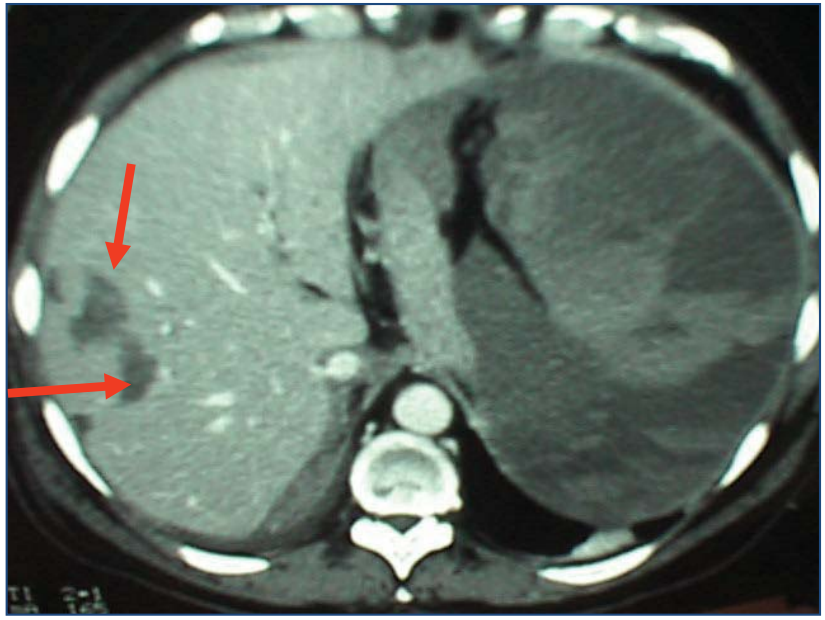
Ritorno

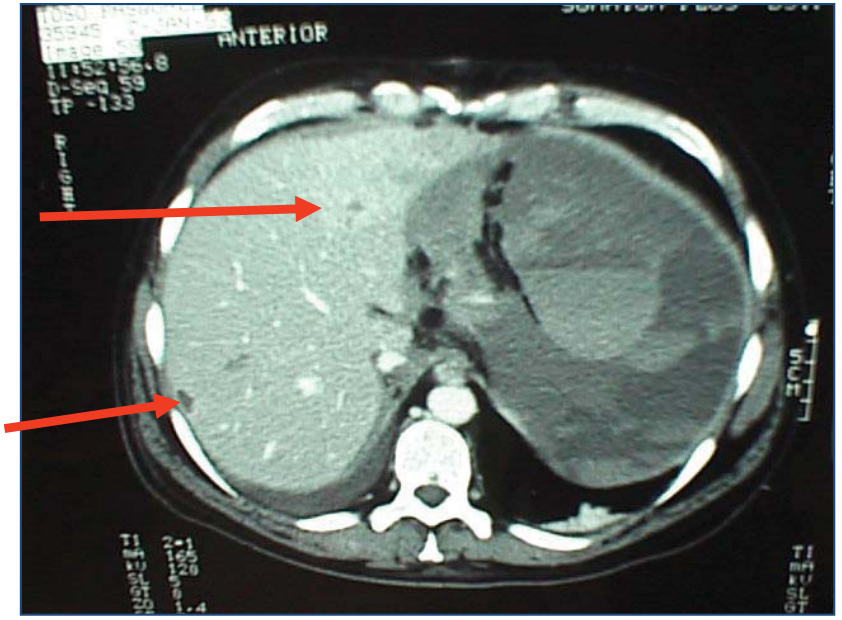
in sala operatoria

Slow physics

Le metastasi

distrutte





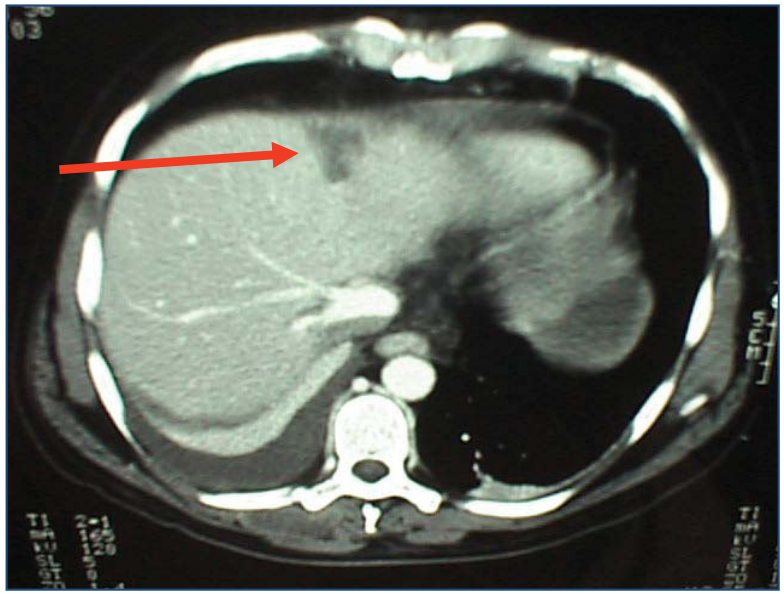
Le frecce indicano le zone necrotiche dopo il trattamento

10 giorni dopo il trattamento, una TAC mostra il fegato sano in buone condizioni mentre le metastasi appaiono come zone di necrosi

Slow physics

Le metastasi

distrutte



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Slow physics

Le metastasi

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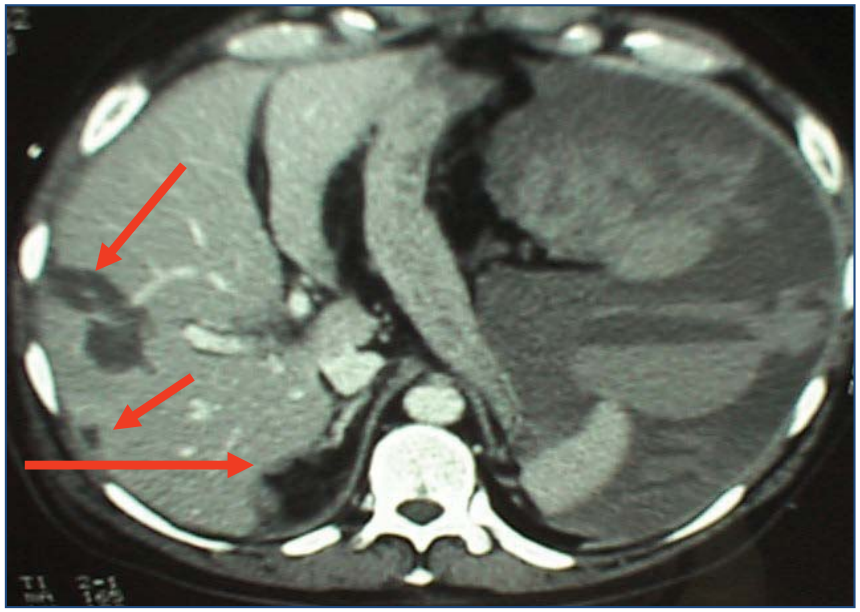


Le frecce indicano le zone necrotiche dopo il trattamento

10 giorni dopo il trattamento, una TAC mostra il fegato sano in buone condizioni mentre le metastasi appaiono come zone di necrosi

Slow physics

Il ritorno

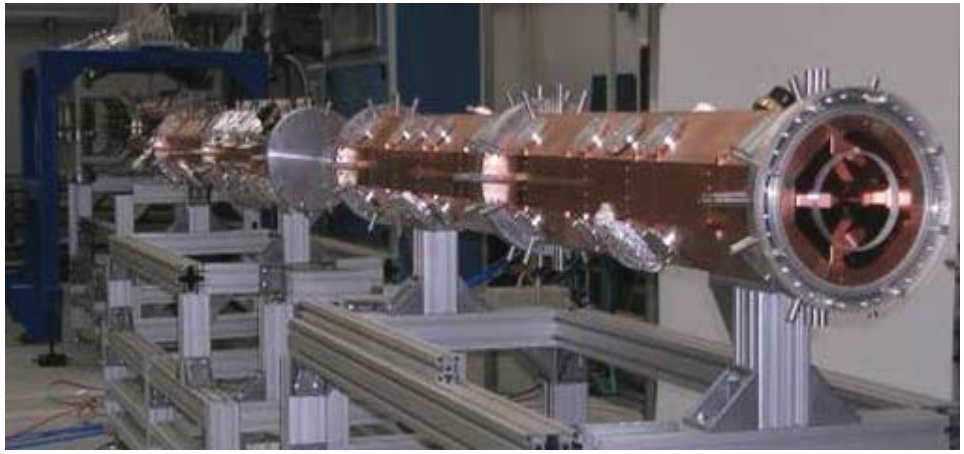
a casa

Il paziente è stato dimesso 37 giorni dopo il trattamento

Slow physics

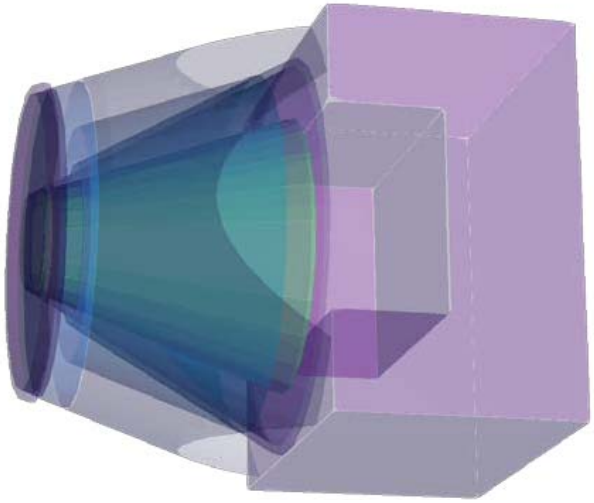
Dal reattore

al CNAO

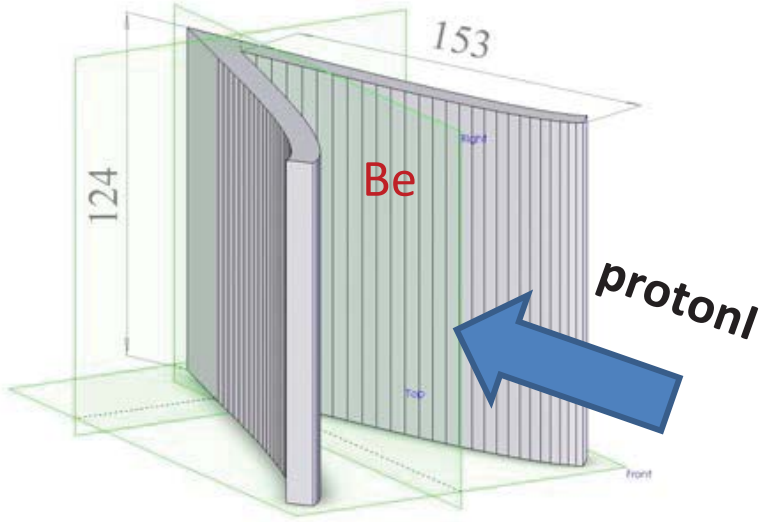


BSA

neutroni lenti



neutroni veloci

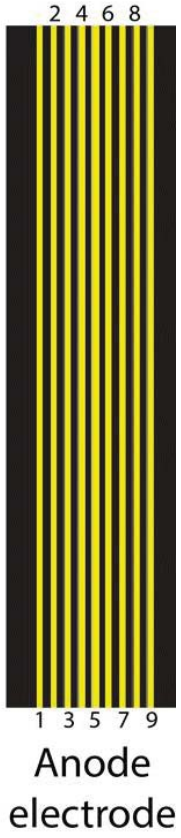


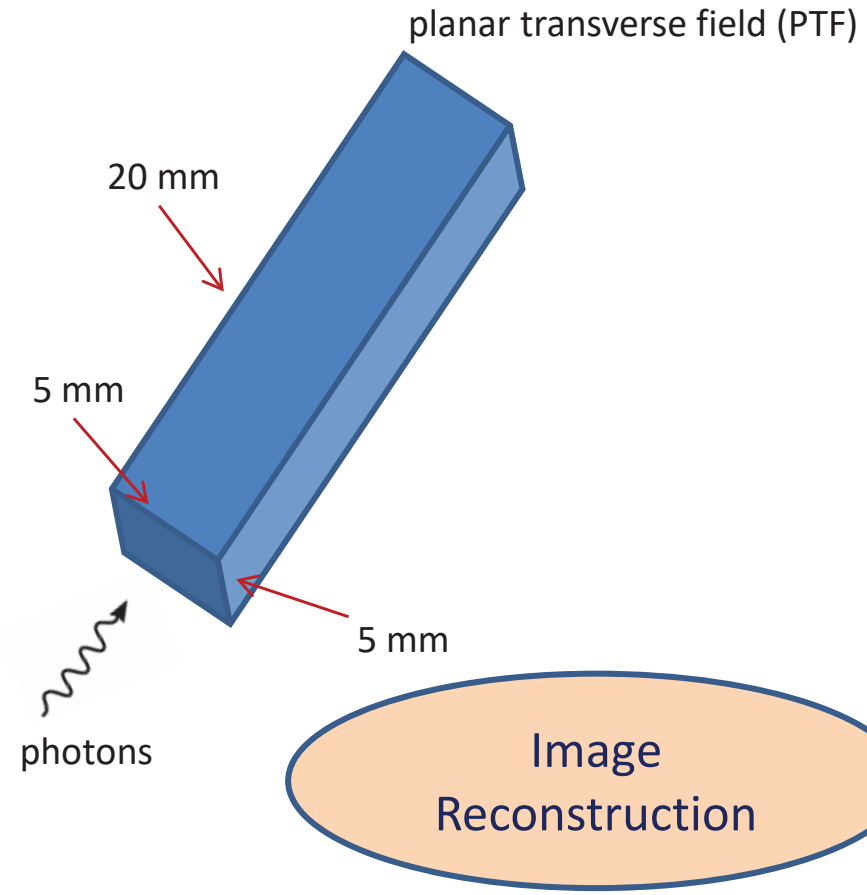
IAN POSTUMA

Slow physics

Imaging

della dose





SETAREH FATEMI

Slow physics

dalla Slow Physics

allo slow food

GRAZIE