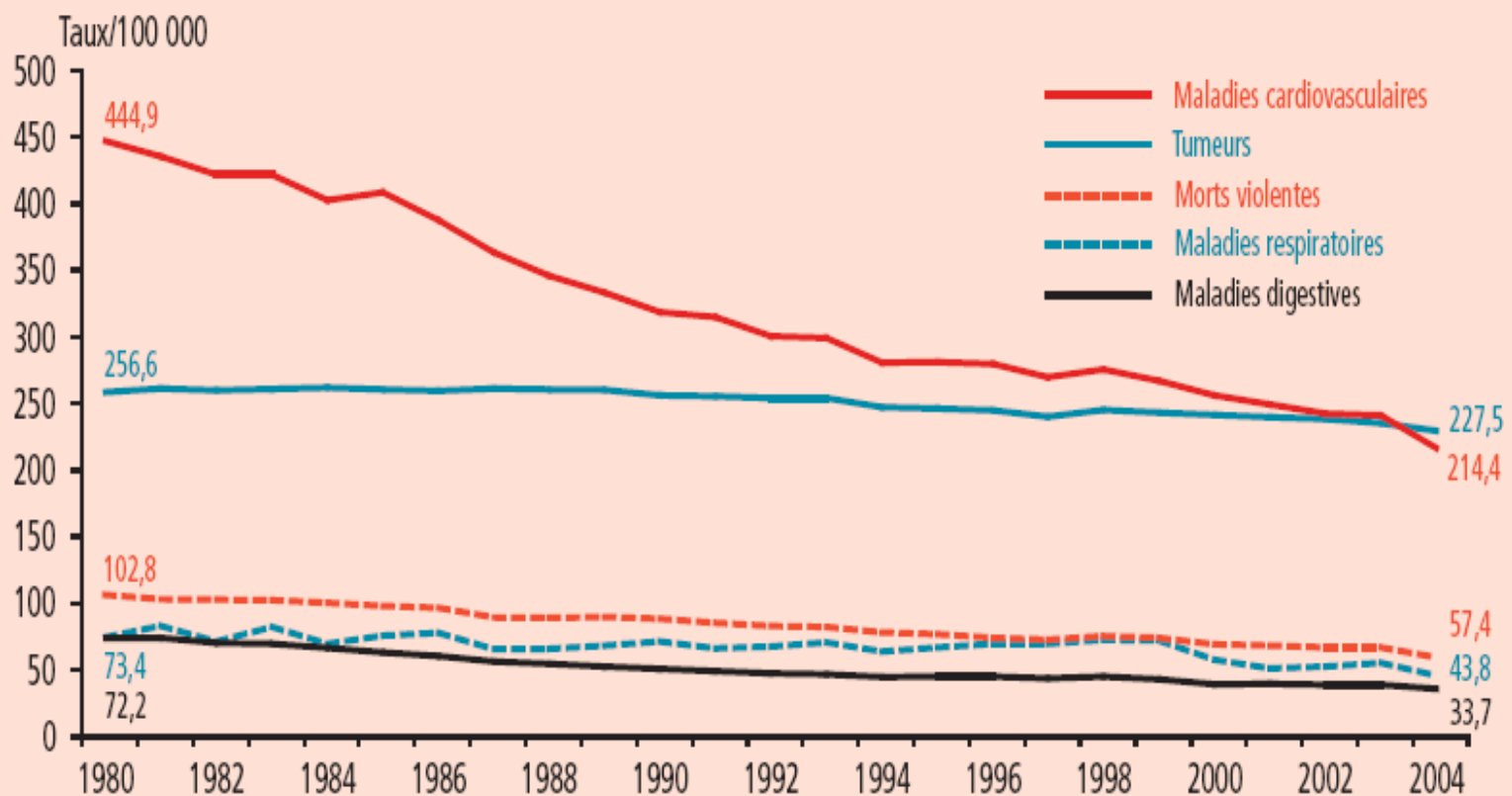


Hadrontherapy

Cancer is now the first cause of human mortality in France :

Figure 2 Evolution des taux de décès par grande catégorie de causes de décès, 1980-2004, France métropolitaine, deux sexes / Figure 2 Trends in death rates by main category of causes of death, 1980-2004, Metropolitan France, both sexes*



* Taux de décès standardisés pour 100 000.

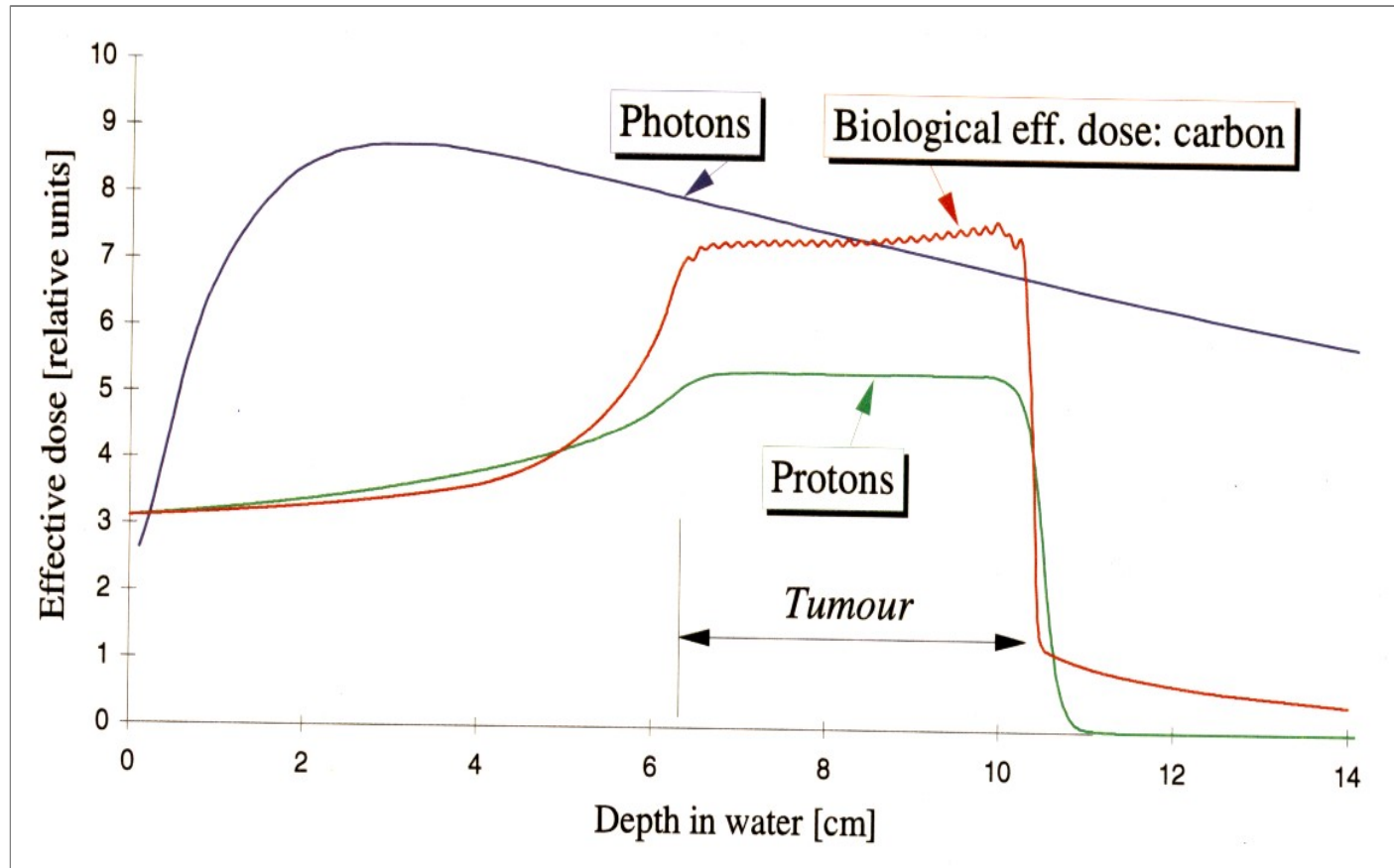
Cancer prevalence in France

320 000 new cancer patients in 2005

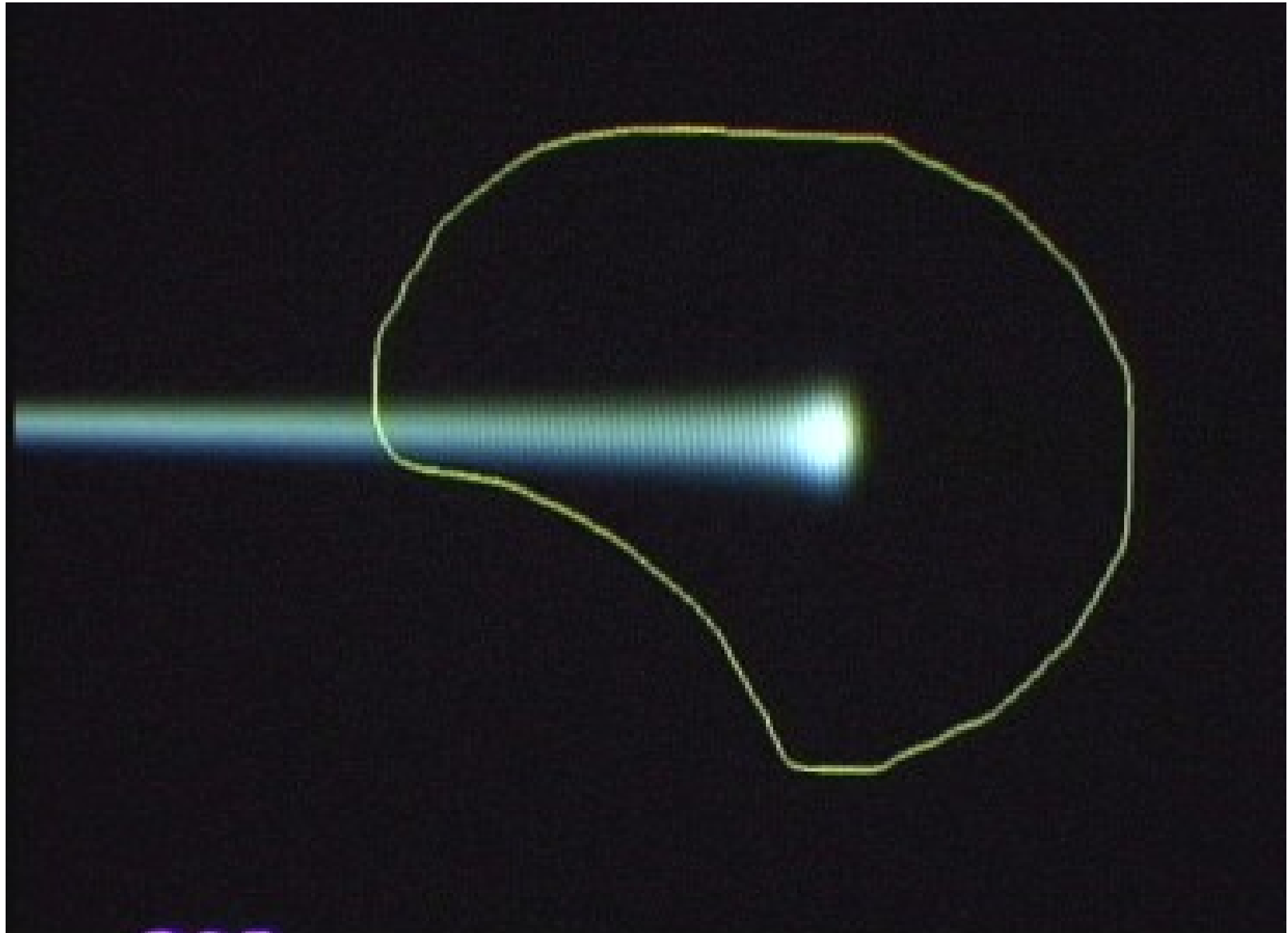
160 000 patients/year treated by radiotherapy

12% of global cancer budget

Hadrontherapy

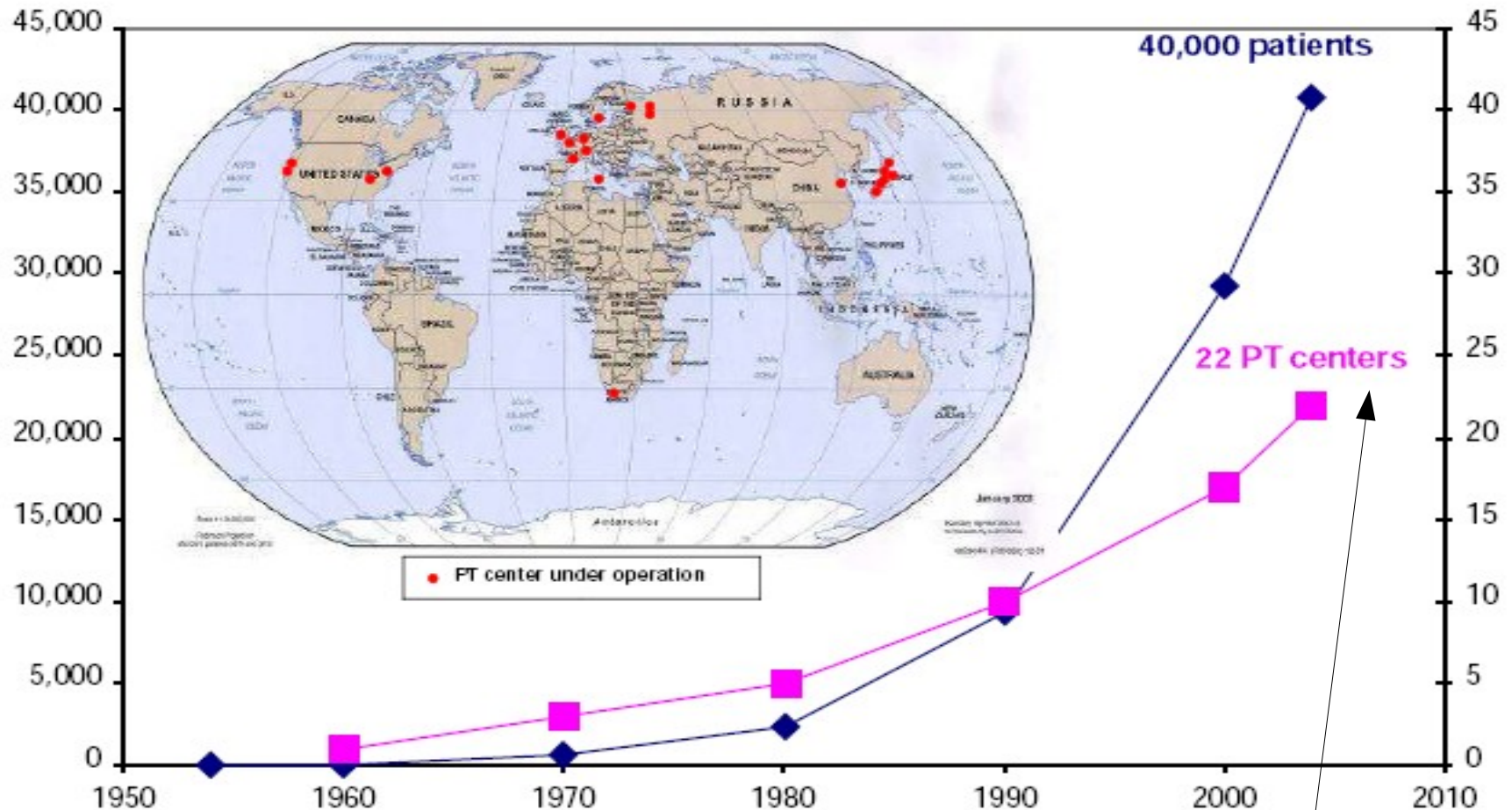


PSI spot scanning protontherapy



Protontherapy is blooming !

Rapid growth



Courtesy J. Sisterson, MGH

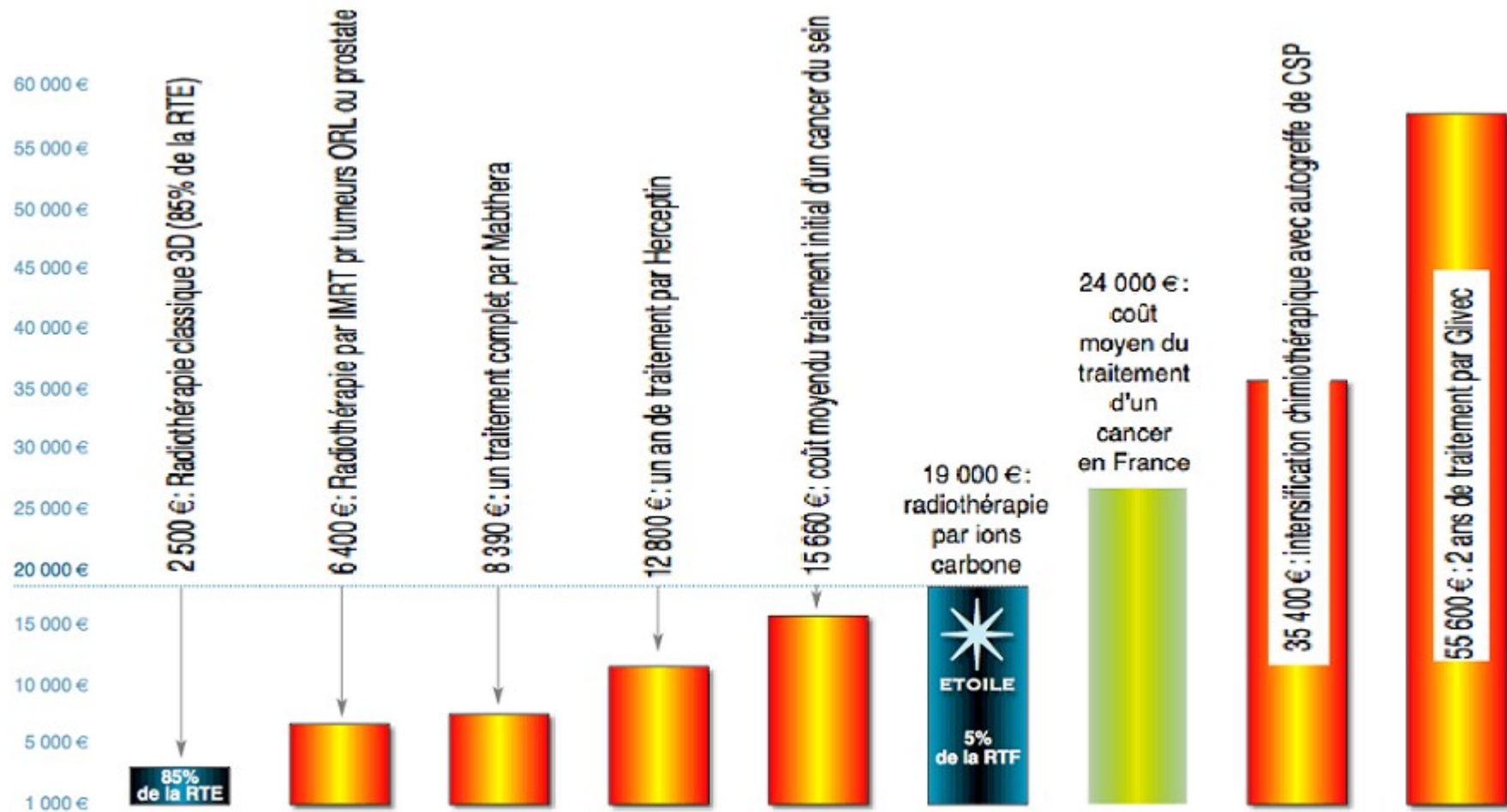
S. Peggs, PAC07, June 25 '07

BROOKHAVEN
NATIONAL LABORATORY

2 centers in France : CPO
and CAL

1 in South Korea NCC (Ilsan)

At an affordable cost !

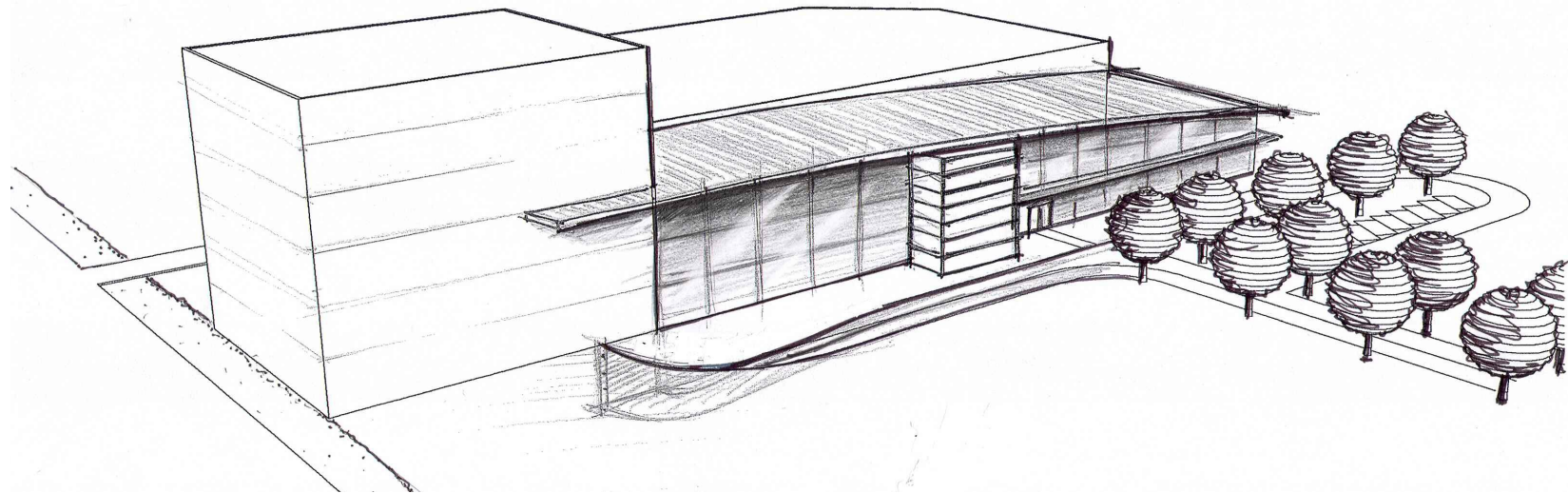


ETOILE : light ion center in Lyon

4800 MeV C and 200 MeV p

Private Public Partnership

Opening 2013 ?



RACCAM

Can FFAG (Fixed-Field Alternating Gradient) accelerators join the medical proton machines ?

Fixed-Field : fast cycling (100 Hz)

light magnets : fast energy variation (0.1 s)

room for more than one X-traction port

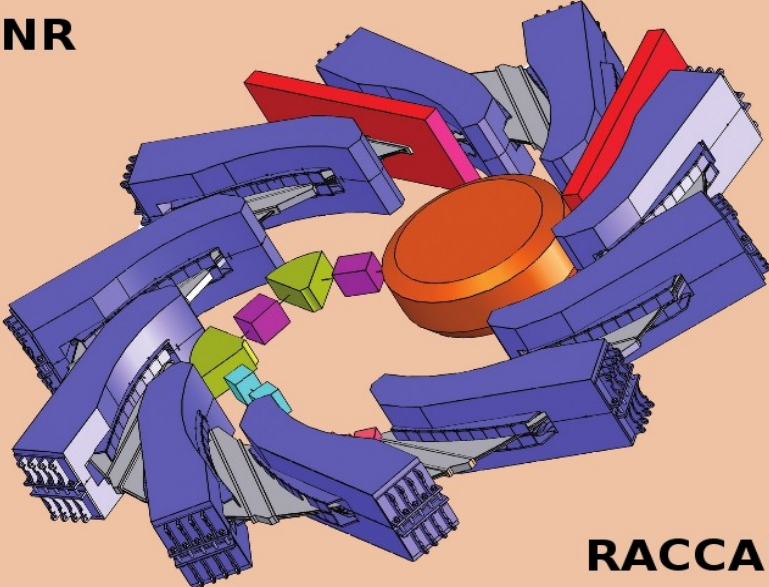
Accepted for publication in NIMA

INTERNATIONAL JOURNAL OF HIGH-ENERGY PHYSICS

CERN COURIER

VOLUME 48 NUMBER 7 SEPTEMBER 2008

ANR



RACCAM

A route to rapid acceleration

CERN
LHC gets onto the starting blocks p5

LHC FOCUS
Nobel expectations at Lindau meeting p29

ENERGY
Chris Llewellyn-Smith looks to the future p33

Principle of energy variation

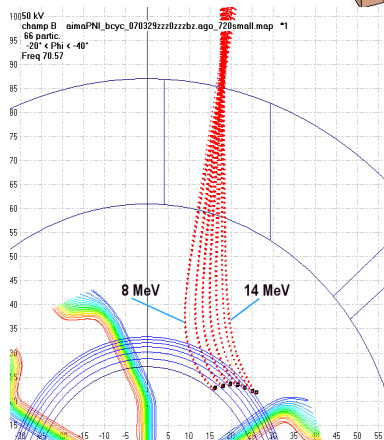
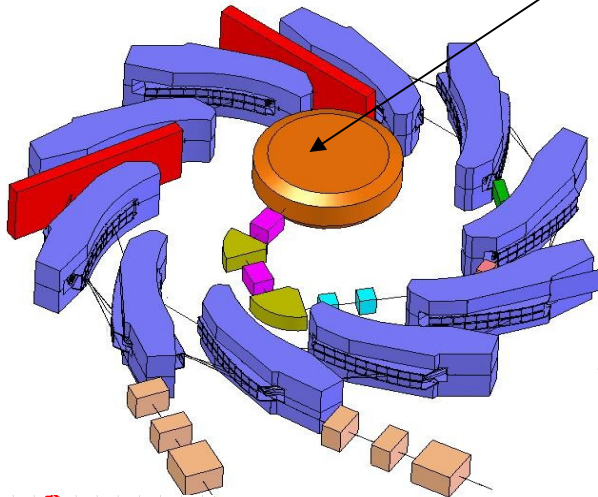
Variable extraction energy from
Injector – H⁻ cyclotron
(AIMA),
5.5-17 MeV

Allows variable extraction energy from
FFAG, 70-180 MeV,
i.e., 4 to 21 cm Bragg peak penetration

by varying FFAG rigidity

+

extraction kick
synchronised on turn #



Magnet prototyping in collaboration with SIGMAPHI



Max. field : 1.7 T

spiral dipole magnet

Final parameters of the RACCAM 10 cell ring and magnet :

Extraction energy, variable

70 – 180 MeV

Injection energy

5.5 – 17 MeV

Momentum ratio

3.62

Number of cells

10

Packing factor

0.34

Field index, k

5

Spiral angle

53.7 deg.

Q_h / Q_v

2.76 / 1.55~1.60

Radius on extraction/injection orbit : dR

3.46 m / 2.78 m / 0.67 m

Drift length, extraction/injection orbit

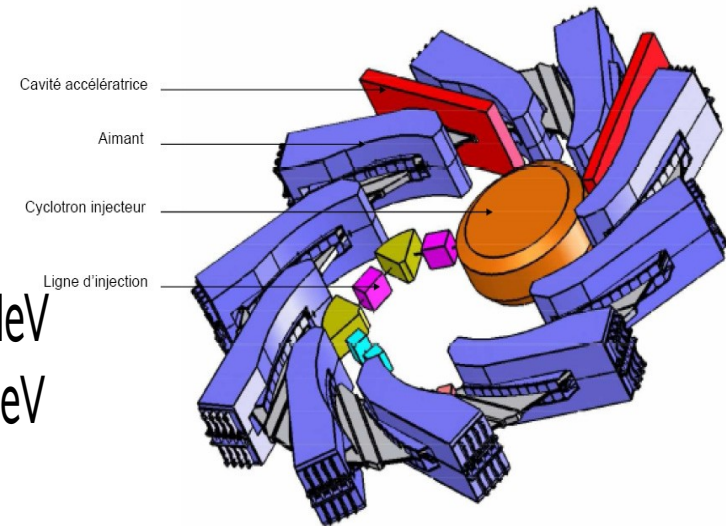
1.42 m / 1.15 m

Frev, 15->180 MeV

3.03 -> 7.54 MHz

Frev, 5.5->70 MeV

1.86 -> 5.07 MHz



RACCAM collaboration

LPSC - Grenoble

SIGMAPHI - Vannes France

AIMA Development - Nice

IBA - Louvain-la-Neuve

CHU - Grenoble

CHU - Lyon

We would like to move towards a Detailed Technical Design.

More colleagues are welcome ... !