



Possibilità di tesi presso il CNAO

Marco Pullia per conto del gruppo acceleratori

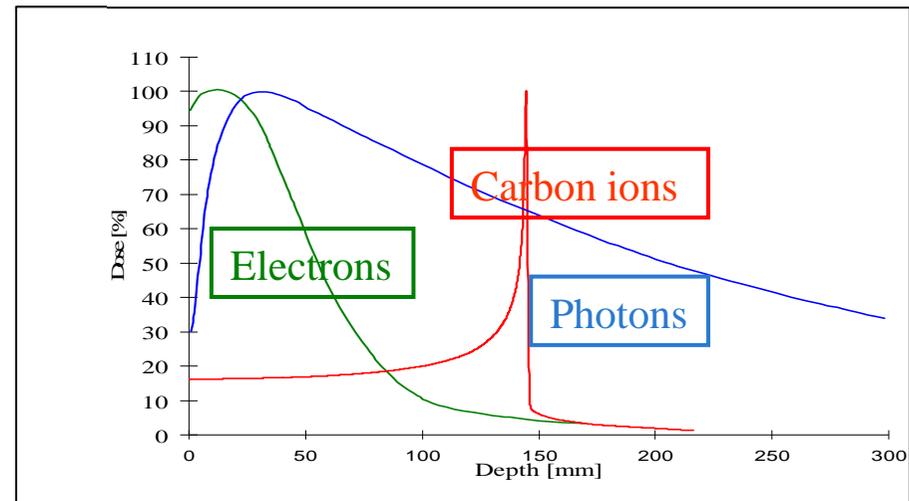
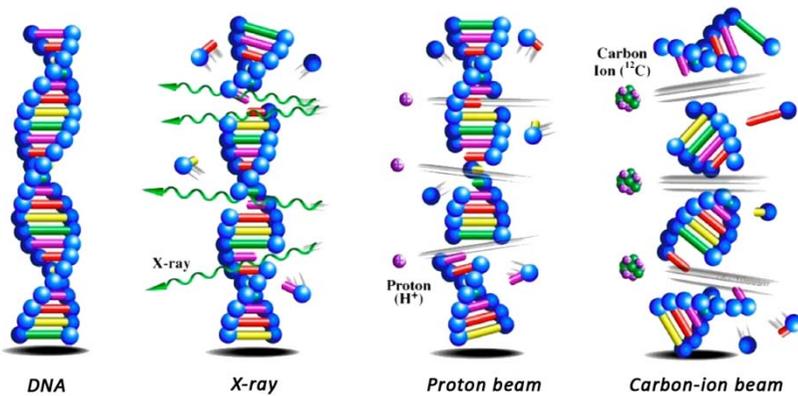
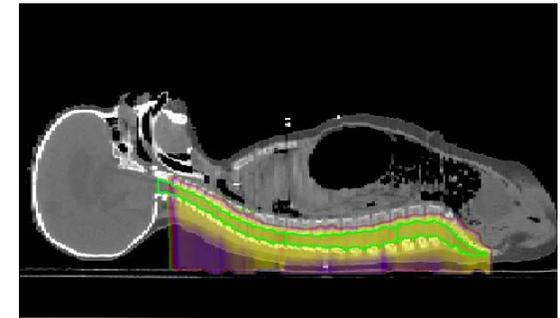
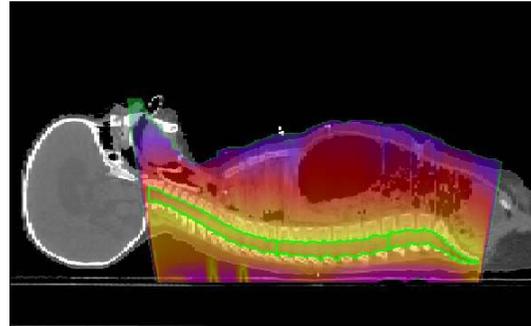
Dottorato in Fisica "Sapienza" Università di Roma, 28 ottobre 2019

Thesis possibilities at CNAO (Pavia)

CNAO

A centre dedicated to tumour treatment with protons and carbon ions located in Pavia

More precise, more efficient



Third source

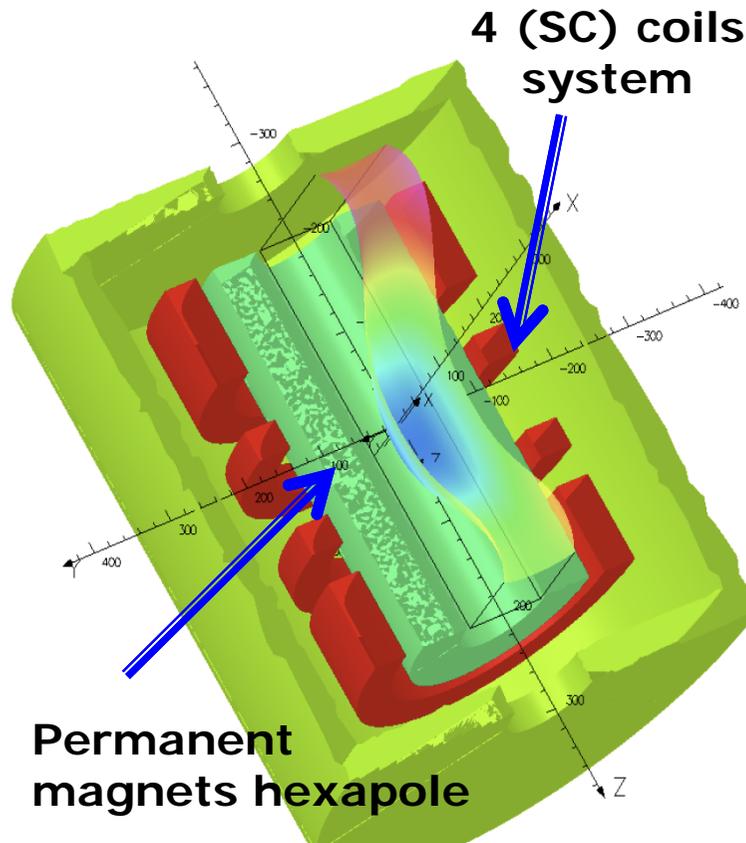
Third source at CNAO

Inspirit proposal approved within
Call Hub Ricerca e Innovazione – Regione Lombardia

Add new source for new ions with its beam line

	H	He	Li	C	O
Z	1	2	3	6	8
I (p/spill)	1.00E+10	2.50E+09	1.11E+09	2.78E+08	1.56E+08
K (MeV/u)	250	261.4	253	400	400

AISHA Advanced Ion Source for HAdrontherapy



AISHA is a hybrid ECRIS: the radial confining field is obtained by means of a permanent magnet hexapole, while the axial field is obtained with a **Helium-free superconducting system**.

The **operating frequency of 18 GHz will permit** to maximize the plasma density by employing commercial microwave tubes meeting the **needs of the installation in hospital** environments.

Radial field	1.3 T
Axial field	2.7 T - 0.4 T - 1.6 T
Operating frequencies	18 GHz – 21 GHz
Operating power	1.5 + 1.5 kW (max)
Extraction voltage	40 kV (max)
Chamber diameter / length	Ø 92 mm / 360 mm
LHe	Free
Warm bore diameter	274 mm
Source weight	1400 kg

INFN - LNS

AISHa

(Courtesy of L. Celona)

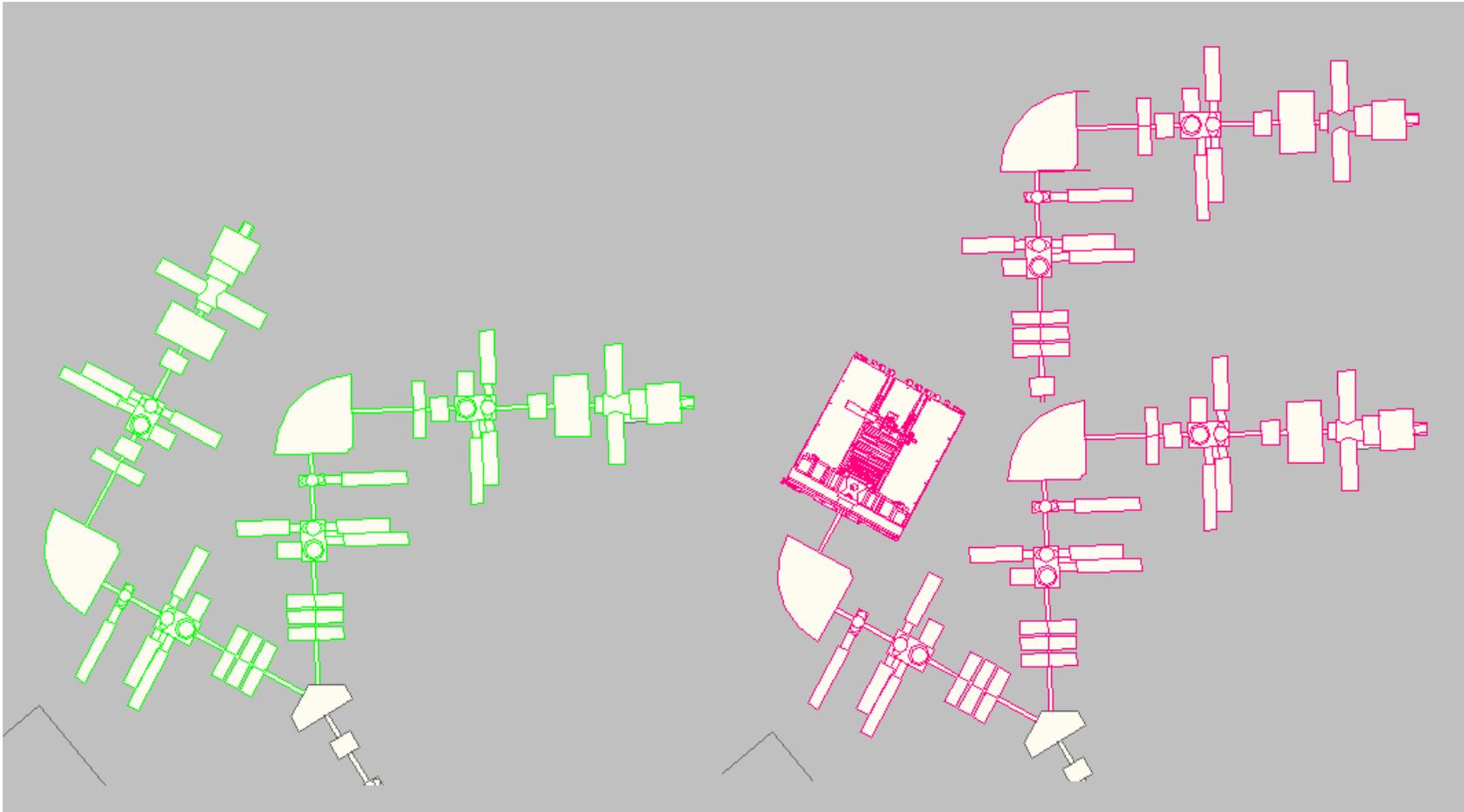
ALSha

Experimental setup



Courtesy of L. Celona

Third source at CNAO



Third source at CNAO

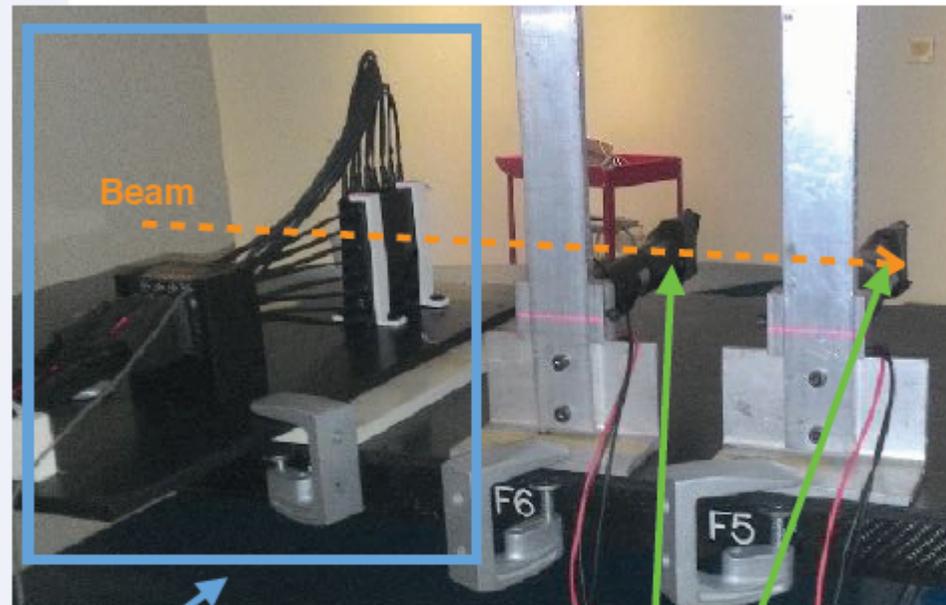
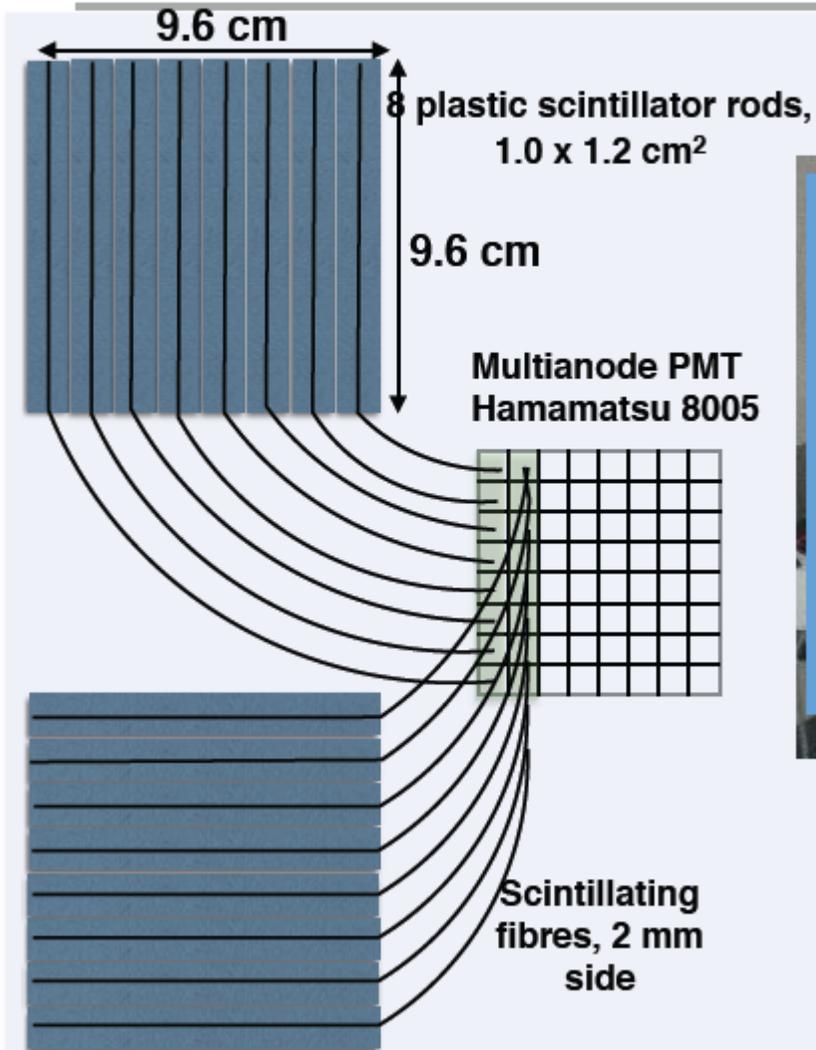
Participation to the (design review and)
commissioning of the new source and LEBT
and possibly commissioning of new ions in XPR

Low intensity monitor

Low intensity monitor

- For some applications (e.g. some detector tests) a low intensity ($10^3 - 10^4$ particles/s) is required
- Such low intensities are out of the measurement range of the DDS and at present shall be monitored by the user
- E.g. a dedicated detector, capable to count the incoming ions and to monitor the beam position in the x-y plane, was provided by the Foot group (INFN - Roma - SBAI)

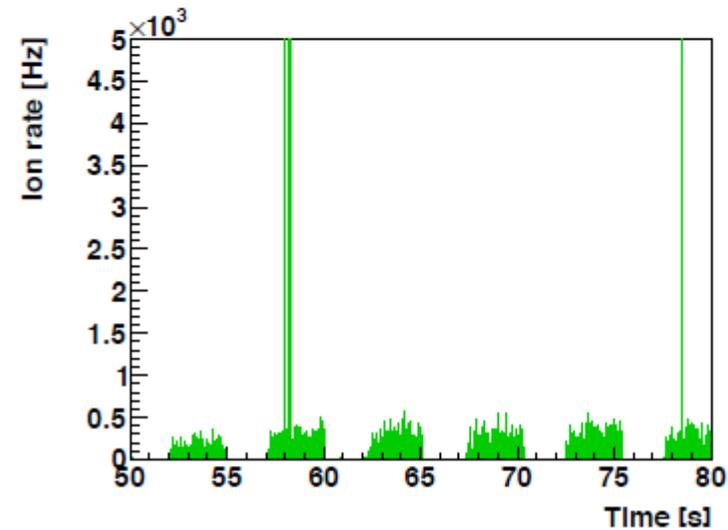
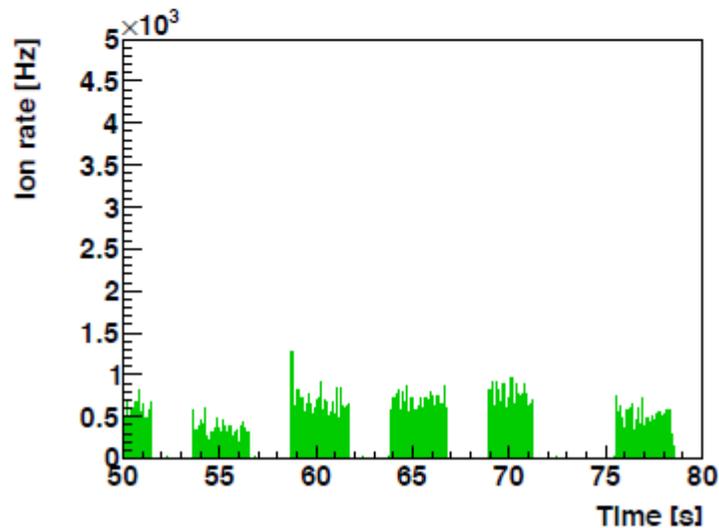
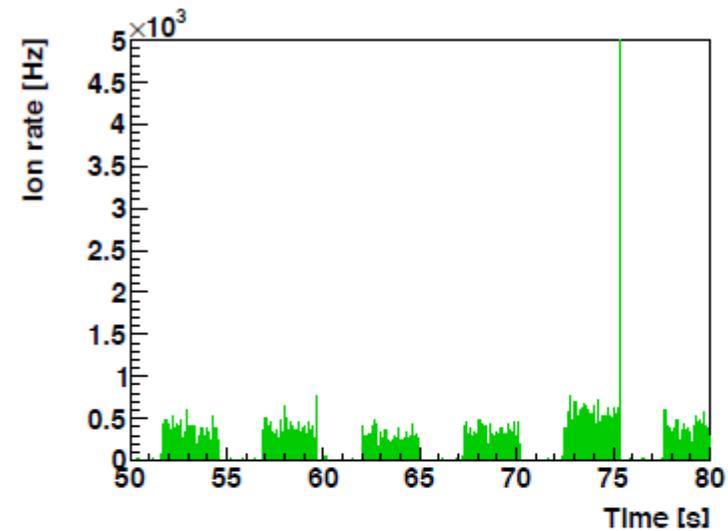
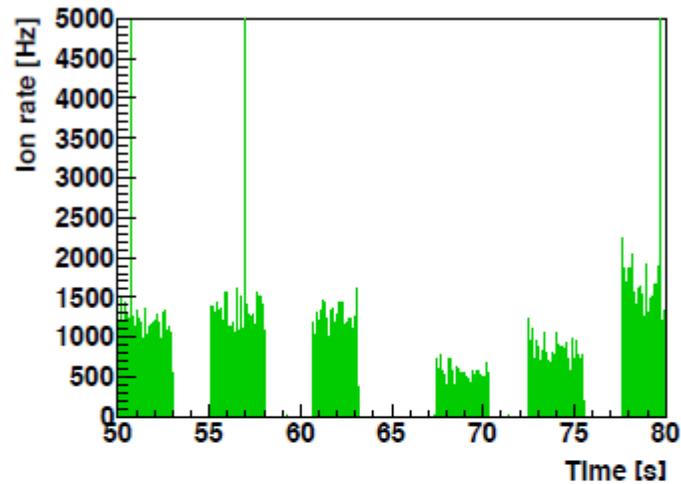
Experimental setup



Plastic scintillators
5x5x5 cm³ for efficiency
measurement

(Courtesy of Giacomo Traini)

Proton beam - Intensities vs time



(Courtesy of Giacomo Traini)

Low intensity monitor

Participation to the design,
construction and implementation
at CNAO (in the CNAO control system)
of the low intensity monitor

In collaboration with Prof. V. Patera - Roma1

Marco.Pullia@cnao.it



Thanks

“The important thing is not to stop questioning”
Albert Einstein