

PARTICLE ORBIT SIMULATION OF DECELERATOR CYCLOTRON FOR RI PRODUCTION

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Abstract

We are studying an IH type linear accelerator for the application as the international cooperative research (Japan, Germany and Romania). Acceleration of deuteron and triton by the IH linac were planned for the production of useful radio-isotopes which is for practical use in medical science. Cyclotron type decelerator with a gas target room is developed. Short life radio-isotope for PET (Positron Emission Tomography) is produced in the decelerator by irradiating deuteron beam to gas target.

This paper will present the conceptual design of the decelerator and report a part of particle orbit simulation.

Introduction

The IH linac has successfully accelerated proton beam. The shunt impedance was estimated to be about $370 \text{ M } \Omega/\text{m}$ by experiment. So we are engaged in the next stage of the project.

Generally, the life of radio-isotope for medical diagnostic is short. Half-life of ^{15}O is in particular only about two minutes. That is, we should do acceleration in hospital, production and refining in hospital, and administration to a patient in hospital. It is necessary that the conceptual design of decelerator be compact, speediness and high efficiency.

Conceptual design

Fig.1 shows conceptual design of the gas target room. Output beam from the IH linac will be deprived of energy by irradiating to gas target, gradually, a rotation radius will be small in the magnet field. And we get the radio-isotope by pumping.

Calculation

We consider differential pumping and betatron oscillation. So the system has an orifice and n-value. Fig.2 shows calculation of the equilibrium orbit. Input energy of

proton beam is 1.6 MeV and the first stage of magnet field is 1 T. And now, we take emittance growth into consideration and compute again.

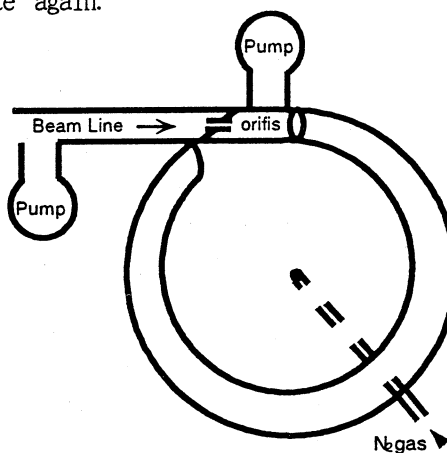


Fig. 1 Conceptual design of the gas target room.

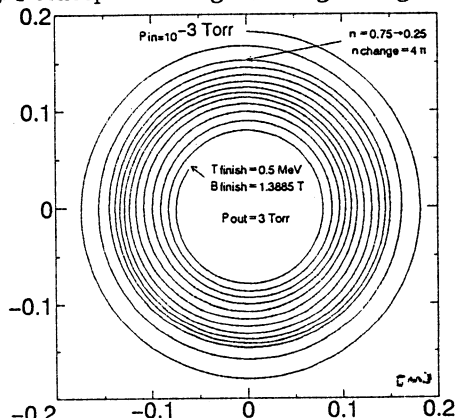


Fig. 2 Calculation of the equilibrium orbit.

References

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