A COMPUTER CODE FIGER

I. Miura, M. Fuki, Y. Kadota, K. Hosono,
T. Yamazaki and M. Inoue

Research Center for Nuclear Physics, Osaka University,
Ibaraki, Osaka 567, JAPAN

Abstract

A computer code was developed to generate artificial magnetic field distribution. Results of the numerical analysis of beam properties for the measured field and the artifical field show a very good agreement. Various fields generated by this code can be used to study the betatron frequencies, the eigen ellipses, the phase plot, property of accelerated beam, injection and extraction.

Introduction

A ring cyclotron project has been proposed at the RCNP[1]. The orbit analyses of the rings are made using the measured field data of the model magnets[2]. Though, the sector angle of the 2nd ring must be reduced by 1° from the original design to accelerate protons up to 550 MeV the fasibility of the plan for the magnets of the rings was confirmed.

Recently, efforts to extend the designed energy range of the rings are being made. For the first trial of the design of ring cyclotron, the modified Spy-Ring code is very convenient to calculate the betatron frequencies, the eigen ellipses, α, β and γ functions and the isochronous field. However, the accuracy of the calculation is not satisfactory for the final design.

Artificial field distribution

A computer code FIGER generates magnetic field distribution of the ring cycltoron. The effective field boundary and the fringing-field are parametorized and given as a input of the code. The artificial fields are calculated for the mesh points on the polar coordinates. The effect of the fringing-field overlapping is also taken into account for neighbouring magnets.

Results

The contour maps of artificial fields and the measured field of the 1/3.5 scale model magnet are shown in fig. 1. The betatron frequencies, ν_R, ν_Z, are calculated numerically[3] for the measured field and the corresponding artificial field from injection radius through extraction radius. These results show extremely good agreement as shown in Fig. 2. The artificial fields are used to study the eigen ellipses, the phase plot[3], and property of accelerated beam[4].

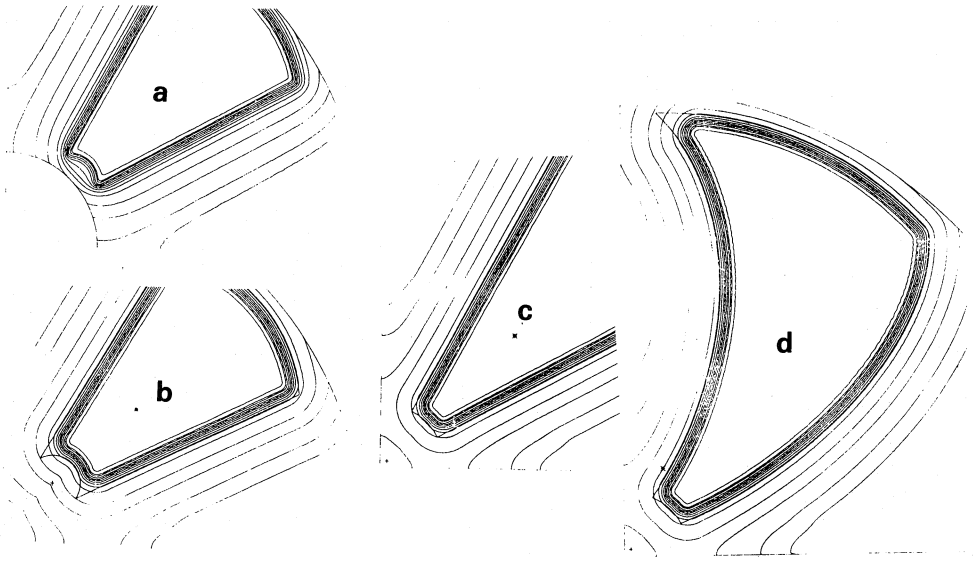

Fig. 1. Contour maps for various fields.
(a) measured field of the 1/3.5 scale model magnet.
(b) the corresponding artificial field.
(c) Artificial field for the 32° straight sector magnet.
(d) Artificial field for the spiral sector magnet.

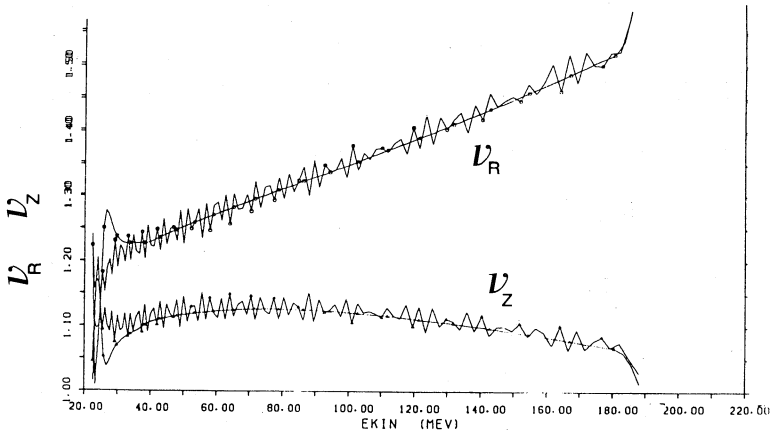

Fig. 2. Calculated betatron frequencies, ν_R, ν_Z of protons for the measured field (∿∿∿) and the artificial field (——).

References

1) I. Miura et al., Proc. 9th Int. Conf. on Cyclotron and Their Applications, Caen (1981) p.89
2) K. Hosono et al.,Proc. 9th Int. Conf. on Cyclotron and Their Applications, Caen (1981) p.379
3) M. Fuki et al., Orbit Analysis of a Ring Cyclotron (I), in these proceedings.
4) Y. Kadota et al., Orbit Analysis of a Ring Cyclotron (II), in these proceedings.