BEAM INJECTION IN RECIRCULATOR SALO

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Abstract

The structure of an injection beam line from electron source output up to accelerating section input of accelerating facility ″SALO″ with continuous electron beam with energy about 730 MeV [1,2] is considered.

Calculation of injection beam line focusing is fulfilled. Parameters of injection beam line magnetic elements, optical functions and beam size are presented.

INTRODUCTION

The basic directions of developed accelerating facility "SALO" [1, 2] application are nuclear researches, reception and use of intensive neutrons beams, creation and use for physical researches free electrons laser. It is obviously that for decision of these problems it is necessary to have several electron sources on the accelerator. For carrying out of many physical researches at energy more than 100 MeV continuous beams of polarized electrons are required. The structure of injection beam line of accelerating facility ″SALO″ carries out lost-free beam posting from two electron sources (RF gun and polarized electron gun [3]), and without essential beam sizes increase at input in of accelerating facility because of electron spread energy.

The arrangement of recirculating accelerator "SALO" in existing premise has defined injection beam line position inside the recirculator ring.

THE INJECTION BEAM LINE STRUCTURE

The elements of injection beam line are located in plane of accelerating facility "SALO". The scheme of injection beam line is shown on Fig. 1. Here B1-B3 are the bending magnets, q1-q7 are the quadrupoles of injection beam line and Q1, Q2 are quadrupoles of an accelerating section. The beam from electron sources leaves antiparallel to beam in accelerating section, bending magnets B1 or B2, turn a beam on 65,32° so beam after magnet B3 passing, turns on 114,68° and left on an axis of an accelerating section.

The beam focusing is carried out by family of quadropoles q1-q7 in such a manner that the condition of spatial acromatic and a condition of affinity to orbits isochronous is fulfilled (R16=0, .R26=0 and R56=0, where RIK-elements 6-measured matrix of injection beam line).

The key parameters of injector and injection beam line magnetic elements are given in Table 1.

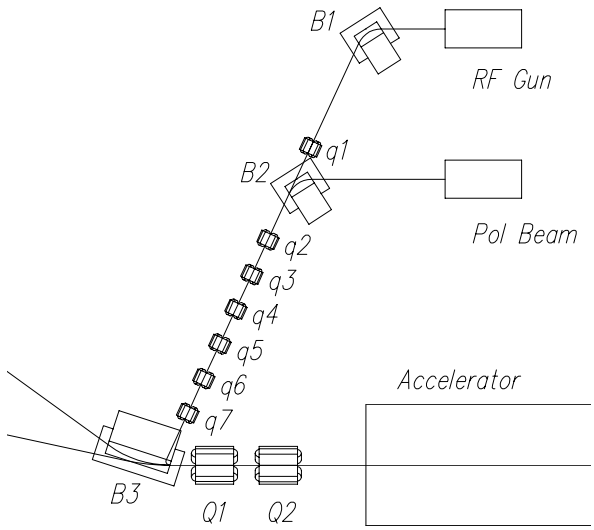

Figure 1

Table 1

Parameter	Value
Injection energy, MeV	9.5
Injection beam emittance, mm.mrad	0.05 - 0.295
Energy spread of injection beam, %	0.0578 - 0.129
Field in magnets B1,2, T	0,1627
Length of magnets B1,2, m	0.222
The vertical aperture of magnets B1,2, cm	2.0
Angle of magnets B1,2, degree	65,32
Field in magnet B3, T	1,023
The length orbit in magnet B3, m	0.062
The vertical aperture of magnet B3, cm	2.5
The magnet B3 angle, degree	114,68
Quadrupole quantity	7
The maximal gradient in quadrupoles, T/m	4.0
Quadrupole length, m	0.1
Diameter of the quadrupole aperture, cm	3

At the maximum energy spread 0.129 % the increase of phase length makes 0,155 mm because of nonzero value R56 that does not affect essentially on final energy spread of a beam accelerator.

On Fig .2, 3, optical functions-BX, BZ, DX and beam size-X, Y for injection beam line from RF-gun are presented. On Fig .4, 5 are presented optical functions-BX, BZ, DX and beam size-X, Y for injection beam line from. polarized electron gun.

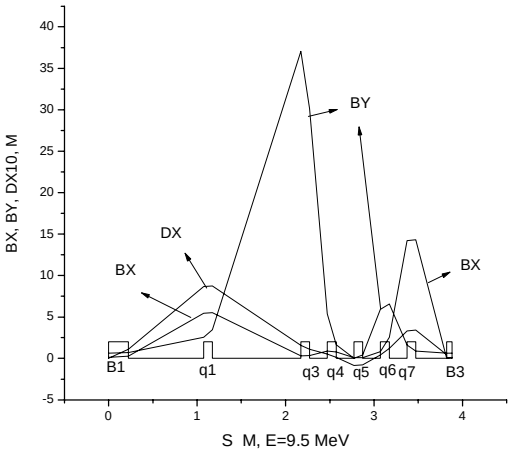

Figure 2

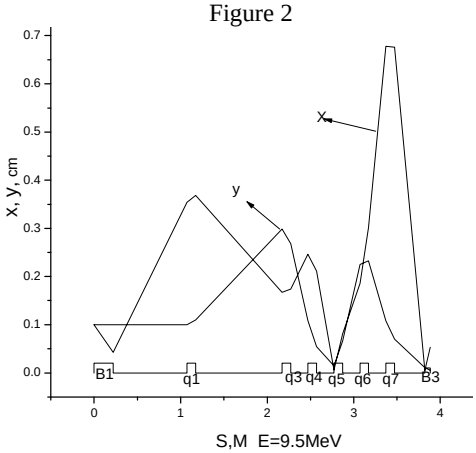

Figure 3

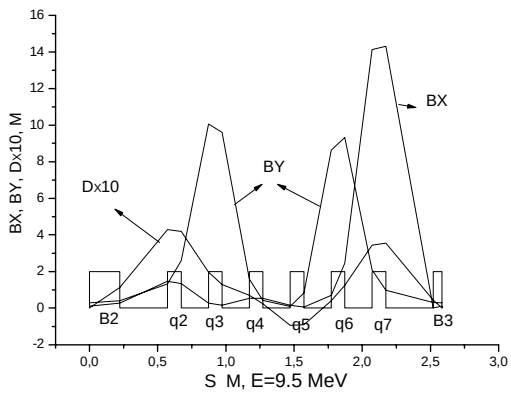

Figure 4

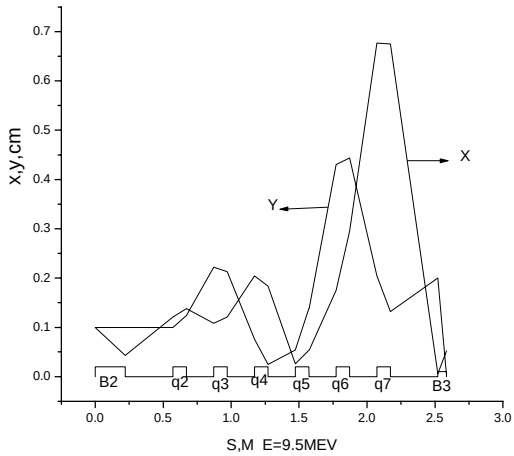

Figure 5

CONCLUSION

Thus, above mentioned parameters of injection beam from line from electron source output up to accelerating interval input satisfy the necessary requirements for recirculation accelerator ″SALO″ with continuous electron beam and energy up to 730 MeV.

REFERENCES

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