II. 4. High Resolution Beam Line at CYRIC

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The C4 beam line at CYRIC was designed to study nuclear physics by using the high resolution beam. It consists of 9 quadrupole and 2 dipole magnets. The layout is shown in Fig. 1. The total bend is 200 degrees, in two opposite direction 95 and 105 degrees segments, with an intermediate focus between the segments. Since the rigidity of the DEF magnet was less than those for the maximum beam energy of the upgraded AVF cyclotron, we replaced the DEF magnet to the old SW2 magnet which specifications were listed in Ref. 2. The ion optics of the C4 beam line for the dispersive mode was recalculated by the code GIOS. Figure 2 shows the result of the calculation including the extraction and additional beam lines (CP and C41). The total magnifications of Mx and My are 0.3 and 0.7, respectively. The momentum dispersion at the point of SLH4-5 is 21.5 m. Figure 3-5 show pictures of beam viewers at ALM4-1, ALM4-2, and the target position and results of the Monte Carlo simulation. In Fig. 5, SLH4-5, which was the slit to cut the beam horizontally, was closed up to 2mm. The initial beam profile was assumed to be (Xi, Ai, Yi, Bi, dPi)=(0.015 m, 0.001 rad, 0.008 m, 0.001 rad, 0.001), in which Xi and Yi were horizontal and the vertical beam sizes, Ai and Bi were angles for the X and Y directions, respectively. The dPi was the momentum deviation of the beam. In the case that SLH4-5 was closed up to 2 mm, the energy resolution of the beam was achieved 0.13 % in the Monte Carlo simulation. We confirmed the energy resolution of 0.4 % with the NaI counter at least.

References

1) Terakawa A., et al, CYRIC Annual Report (2002) 17.
2) CYRIC Annual Report (1980) 8.

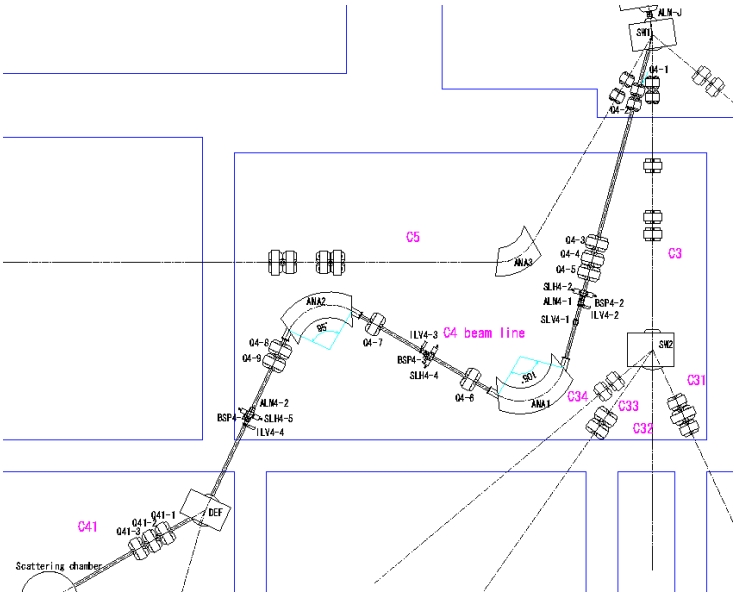

Figure 1. Layout of the C4 beam line.

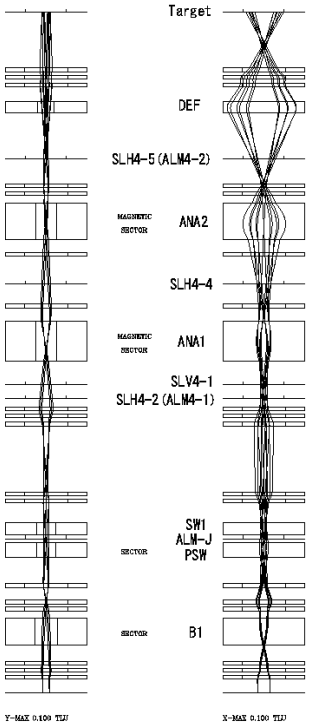

Figure 2. The profile of the dispersive beam transport.

(a) (b)

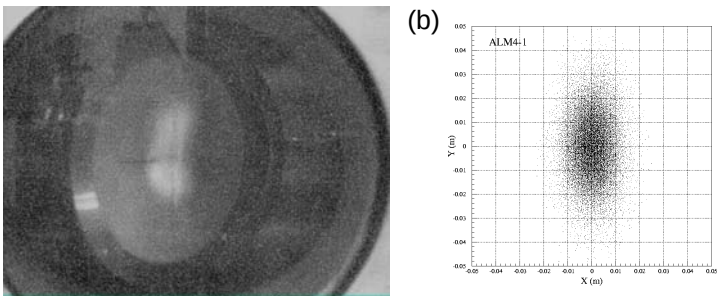

Figure 3.
(a) The beam profile at ALM4-1. (b) The result of the Monte Carlo simulation at ALM4-1.

(a) (b)

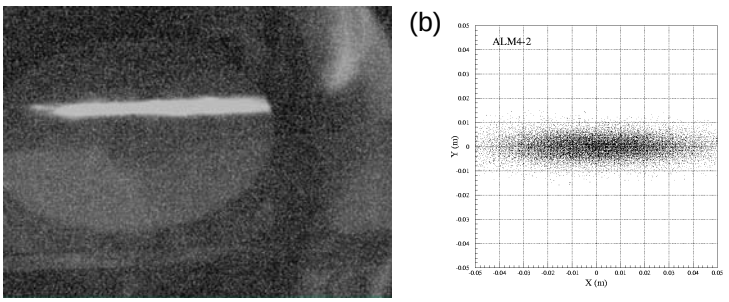

Figure 4.
(a) The beam profile at ALM4-2. (b) The result of the Monte Carlo simulation at ALM4-2.

(a) (b)

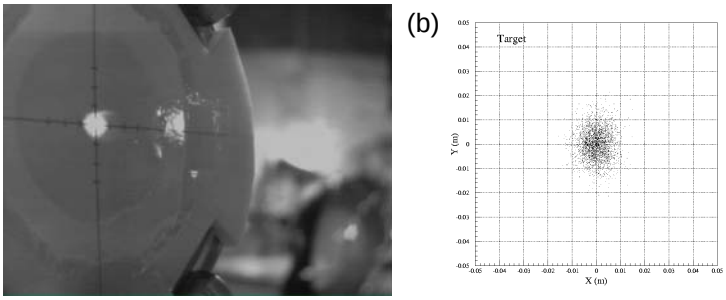

Figure 5.
(a) The beam profile at the target position. (b) The result of the Monte Carlo simulation at the target position.