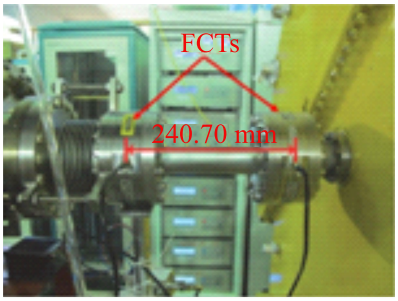


Fig. 4 (color online) Two FCTs for beam energy measurement.

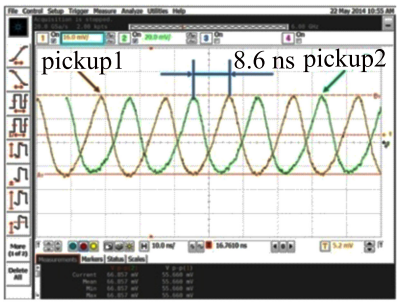


Fig. 5 (color online) Beam signals detected by two FCTs.

The $^{16}O^{5+}$ ion beam was transported through the RFQ and accelerated to 141.9 keV/u on 4th April . The measured current was 149.5 eμA. After carefully conditioning in higher power status, $^{40}Ar^{8+}$ ion beam was successfully accelerated in May 23rd, the measured energy and current were 142.8 keV/u and 198 eμA, respectively. The beam transmission was up to 94%. The beam signals detected by FCTs were shown in Fig. 5.

### References

[1] Chen Xiao, Yuan He, Youjin Yuan, et al., Chinese Physics C (HEP &NP), 36(2012)84.

[2] X. Yin, Y. Yuan, X.H. Zhang, et al., "THE R&D STATUS OF SSC-LINAC", Proceedings of IPAC2014, Dresden, Germany.

## 6 - 3 Closed Orbit Correction in Electron Cooler Section at CSRe

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The injecting section and the cooler section are apart from each other at CSRm, while the electron cooler system is installed at the injecting section of CSRe[1]. So for the CSRe we not only need to satisfy the beam injecting condition but also need to satisfy the beam cooling condition. At present, we use the ramping bump and the kicker to inject beam, and after injection the bump disappear quickly and the beam goes to the cooling orbit and begin cooling. This method has a disadvantage that the beam cooling condition cannot be satisfied until the bump is down. In the past year, we try to find a new method to correct the orbit of cooler section. Instead of using ramping bump we use the fixed bump to satisfy the injecting and the cooling condition at the same time.

We use Winagile for design. Fig. 1 shows the calculated result. From this figure, we can find that there is no closed orbit distortion at the cooler section for the revolution beam, so it will ensure the ion beam and electron beam overlap coaxially on the condition that the ion beam can be injected. Table 1 shows the parameters of the correctors, the currents of the dipoles outside the cooler (D_coll, D_gun) are larger than maximum output currents of the power supply at magnetic rigidity of 5.875 Tm (as shown in Table 1).

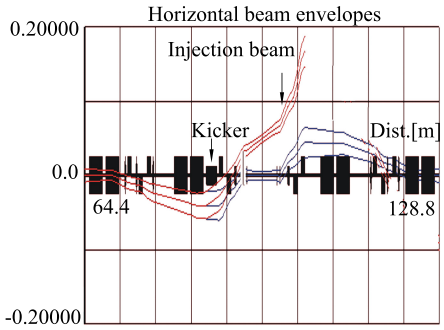


Fig. 1 (color online) The injecting orbit (red lines) and the revolution orbit (blue lines). (328 MeV/u $^{58}Ni^{28+}$, Brho=5.875 Tm).

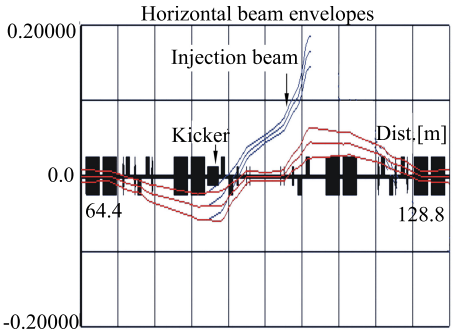


Fig. 2 (color online) The injecting orbit (blue lines) and the revolution orbit (red lines). (328 MeV/u $^{58}Ni^{28+}$, Brho=5.875 Tm, with the opposite magnet field direction).

Table 1 Main parameters of correctors we use to correct the orbit.

| Coil | Angle / mrad | $I_{\mathrm{calculate}}$ / A | $I_{\mathrm{design}}$ / A |
|---|---|---|---|
| 42DC3 | -3.31 | 15.7 | 200 |
| 42DC1 | 2.05 | 7.78 | 200 |
| 42CEx2 | 4.61 | 118 | 400 |
| D-coll | -13.07 | 1009 | 780 |
| Torcoil | 2.5 | 390 | 780 |
| Torgun | -2.5 | 390 | 780 |
| D-gun | 16.16 | 1250 | 780 |
| 41CEx2 | -7.47 | 191.1 | 400 |
| 41DC2 | -2.21 | 10.87 | 200 |
| 41DC3 | 4.12 | 16.8 | 200 |

To solve this problem, we find that if we can reverse the direction of magnet field of the cooler, the currents of the dipoles outside the cooler will reduce. Fig. 2 and Table 2 show the calculated result with the opposite direction of magnet field.

From the calculated result we find that this method is feasible. In the coming year we will try to use our new method on our machine to find whether it is available.

Table 2 Classification standard of the second general survey of soil.

| Coil | Angle / mrad | $I_{\mathrm{calculate}}$ / A | $I_{\mathrm{design}}$ / A |
|---|---|---|---|
| 42DC3 | -3.31 | 15.7 | 200 |
| 42DC1 | 2.05 | 7.78 | 200 |
| 42CEx2 | 2.81 | 71.9 | 400 |
| D-coll | -6.27 | 484.4 | 780 |
| Torcoil | -2.5 | 390 | 780 |
| Torgun | 2.5 | 390 | 780 |
| D-gun | 8.96 | 693.07 | 780 |
| 41CEx2 | -5.28 | 135.07 | 400 |
| 41DC2 | -2.21 | 10.87 | 200 |
| 41DC3 | 4.12 | 16.8 | 200 |

## References

[1] Lijun Mao, Xiaodong Yang, Jie Li, et al., High Power Laser and Particle Beams, 17(7)2005.

[2] J. Dietrich, V. Kamerdzhiev, B. Lorentz, et al., " Closed Orbit Correction in 2 mev Electron Cooler Section at Cosy-juelich", Proceedings of COOL'11, Alushta, Ukraine.