Transactions of the Korean Nuclear Society Spring Meeting
Gyeongju, Korea, May 29-30, 2008

Installation of Drift Tubes for 100-MeV Proton Linac Accelerator

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1. Introduction

Proton Engineering Frontier Project (PEFP) is developing 100-MeV linac. It consists of an ion source, a low-energy beam transport (LEBT), a 3-MeV radio-frequency quadrupole (RFQ), and a 100-MeV drift tube linac (DTL). The DTL is divided as 20-MeV and 100-MeV DTL. The 20-MeV DTL [1, 2] is comprised of 4 tanks which accelerate 20-mA proton beams up to 20-MeV. 20-MeV DTL is already developed and supplies the proton beam to users. The 100-MeV DTL [3] consists of 7 tanks to accelerate proton beams to 100-MeV and it is under development. Among 7 tanks, we finished the installation of the drift tubes (DT) for the 2nd tank (tank 102). In this paper, the alignment scheme for PEFP drift tubes is described.

2. Alignment

2.1 Alignment goal

Tolerances of the transverse (Δx , Δy) and longitudinal displacement (Δz) from the design values are listed in Table 1.

Table 1: Tolerances for alignment

	Δx , Δy	Δz
At measurement position	$\pm$ 0.5mm	$\pm$ 0.1mm
At center of the DT magnet	$\pm$ 0.05mm	$\pm$ 0.1mm

2.2 Alignment method

We aligned 27 drift tubes in the DTL tank using two laser trackers. To avoid the effect of environment, the alignment procedures are accomplished in the vinyl house where air conditioner is installed. As shown in Fig. 1, each laser trackers were installed at front and end position of DTL 102. The drift tube position can be monitored in real time by using two reflectors and laser trackers, as shown in Fig. 2.

Fig. 1. Drift tube align procedure was accomplished with two laser trackers to real time position measurement. To improve the accuracy of laser tracker, all works are done in the vinyl house.

Fig. 2. Laser reflector holder for the drift tube alignment. The holder can fix two reflector which can be seen each laser tracker.

The drift tubes are fixed on the DTL 102 tank with adjusting mechanism. It consists of three bolts for each x, y, z axis. During the position adjustment, we can see the real time position due to the two laser trackers.

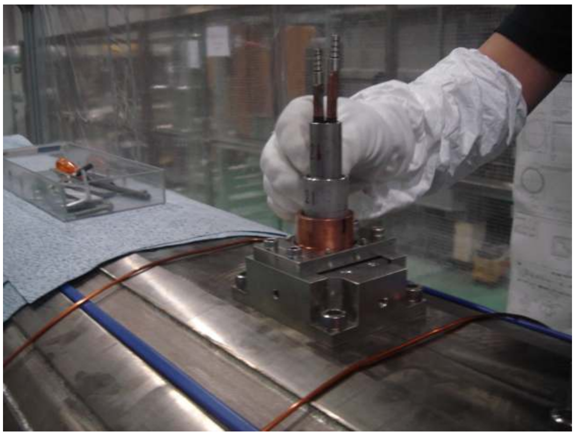

Fig. 3. Drift tubes are fixed on the DTL tank by adjusting mechanism.

3 Alignment results

Fig. 4 shows the deviation of the drift tube's position in measurement points after the alignment procedure. The deviation of the measured values meets the required tolerance. Due to the various errors, especially machining error of the DTL tank, the deviation of vertical position is somewhat large.
Fig. 5 shows the deviation of center of DT magnet from the design values. The displacement of transverse (Δx , Δy) is aligned within ±40 ㎛ and longitudinal displacement (Δz) errors also meet the required tolerance.

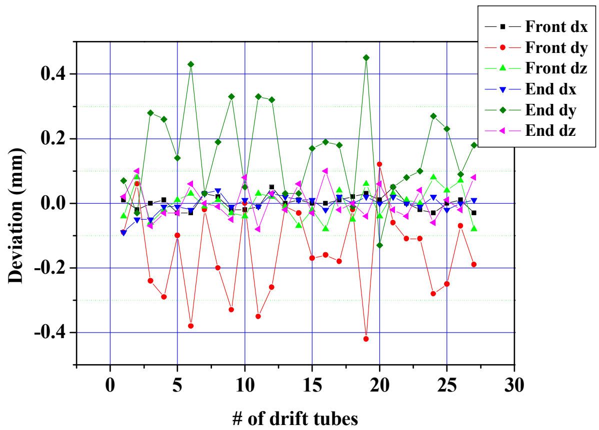

Fig. 4. Measurement results of DT's position on measurement positions

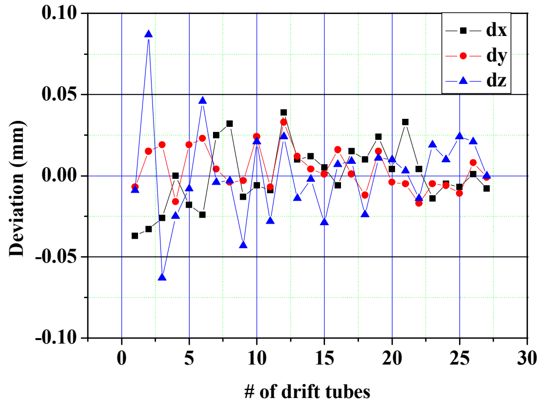

Fig. 5. Measurement results of DT's position on the center of measurement positions

3. Conclusions

27 drift tubes were installed in PEFP's DTL 102. They were aligned within ±40 ㎛ accuracy which satisfies the requirement of the alignment for the PEFP's DTL. We adopted two laser trackers for monitoring the position of DT in real time. It is most effective method to align DTs and we will align all DTs of 100-MeV DTL using this method.

The authors would like to thank members of SA engineering Co. for valuable discussions and suggestions. This work was supported by Ministry of Education, Science and Technology of the Korean Government.

REFERENCES

[1] M. Y. Park, Y. S. Cho, J. H. Jang, Y. H. Kim, H. J. Kwon, "Fabrication Status of the PEFP 20 MeV DTL", Proceedings of EPAC 2004, Lucerne, Switzerland, p. 1369, 2004.
[2] Y. S. Cho, H. M. Choi, S. H. Jan, I. S. Hong, J. H. Jang, H. S. Kim, K. Y. Kim, Y. H. Kim, H. J. Kwon, "Development of PEFP 20MeV Proton Accelerator", Proceedings of EPAC 2006, Edindurgh, Scotland, p. 1609, 2006.
[3] J. H. Jang, Y. S. Cho, H. J. Kwon, Ky Kim, Y. H. Kim, "Design of the PEFP 100MeV Linac", Proceedings of LINAC 2006, Knoxville, Tennessee USA, p. 130, 2006.