Survey and Alignment of the 100MeV Linear Accelerator

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1. Introduction

KOMAC [1] is developing a 100MeV high-duty-factor proton linac. Linac is composed with a 50keV proton injector, a 3MeV RFQ, DTL tanks and a beam dump[2]. In this paper, the survey and alignment scheme are described. To install the accelerator, the align network was built and the survey work was accomplished. On the basis of the survey result, all of the accelerator components were installed in the tunnel with two laser trackers. The 100MeV linear accelerator was installed and under commissioning at the Gyeongju site.

2. Survey

2.1 Coordinate System

The align network was installed on the tunnel wall. The distance between each align network is the 5m for right side and 10m for the left side. The total number of the tunnel networks is 42 and the height of the fixed position is 1.8m.

The coordinate system was setup. The vertical axis(+Y) was setup by the NIVEL(Leica co.). Two permanent references, as shown in Fig.1, were used. The origin was determined by the A3. And the Z axis was set by the X and Y coordinate of the A1. These coordinates are linked to the construction coordinate system. The tunnel coordinate system is extended by using see-through holes from the 1st floor to the 2nd floor.

2.2 Installation

Two laser tracker systems were used to mark the anchor bolt positions of the linac. The positioning was accomplished without the support of the air utility. The temperature of the tunnel was 7°C in the winter. The difference in temperature is 20°C compared to the operation condition. So, the thermal expansion rate, 1.2X10-5/°C-m for the concrete, was considered to determine the anchor bolt positions. Fig. 2 shows the variation of the tunnel floor level according to the coordinate system. To compensate the floor level variation, steel plates were placed under the support with different thickness.

The wave guide was installed from the klystron gallery(2nd floor) to the tunnel (lst floor). The linac and circulators were positioned according to the extended tunnel coordinate system.

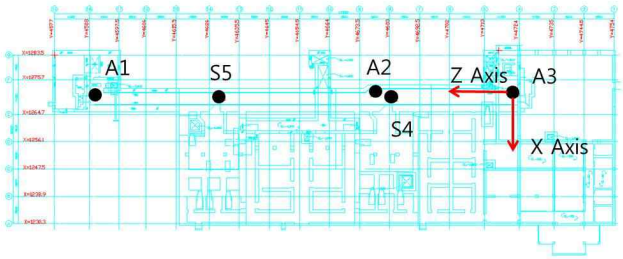


Fig. 1. Coordinate system of the 100MeV proton linac. A3 is the origin and the Z axis was setup by using the coordinate of A1. The coordinates of A1 and A3 are linked with the coordinate system used for the construction.

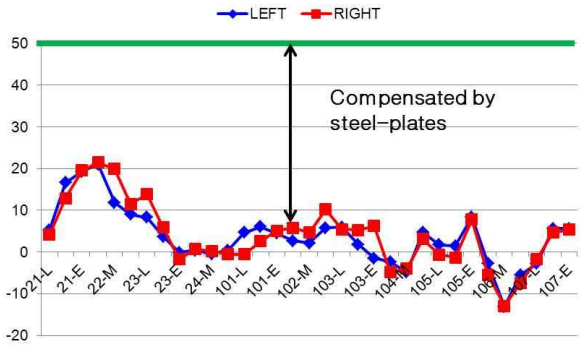


Fig. 2. Floor level for the DTL support position. The deviation was compensated by using steel-plate which has the various thickness.

Fig. 3. 100MeV linac which was positioned at the tunnel.

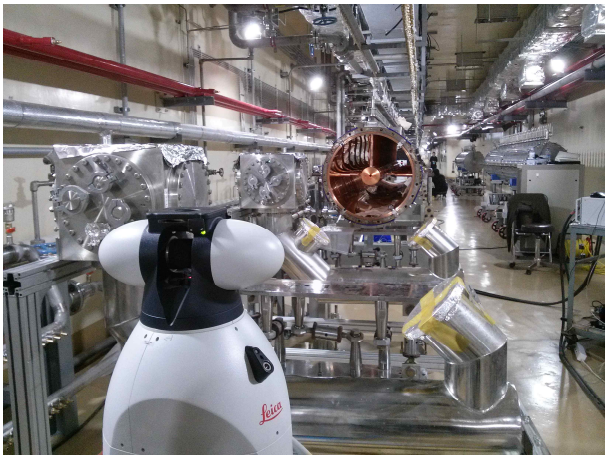
3. Alignment of the 100MeV Linac

3.1 Drift tube

The DTL was manufactured and the drift tubes(DTs) were aligned in the KAERI site. It was delivered from Daejeon to Gyeongju site by using the vibration-free vehicle. Before the installation of DTLs, we checked the DT alignment condition. According to the results, DT position was not satisfied the alignment criteria. So, all of DTs were realigned as shown in Fig. 4.

3.2 100MeV Linac alignment

After the alignment of the DTs, the 100MeV linac was aligned in the tunnel. Fig. 5 shows the DTL tank alignment by using two laser tracker systems under the real time position monitoring condition. By using this method, we aligned the 100MeV linac, from the injector to the beam dump, in the tunnel.



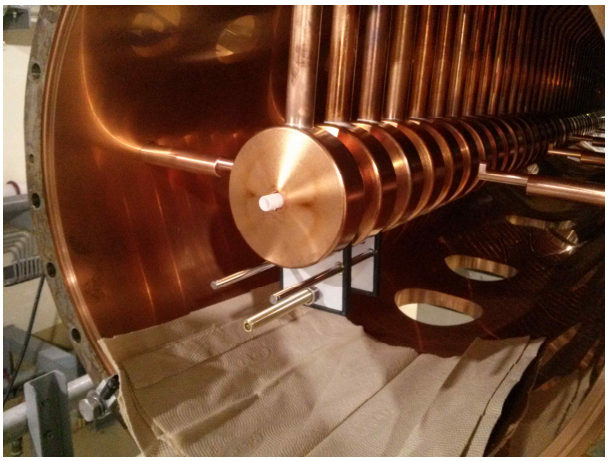


Fig. 4. The position of drift tubes were checked and realigned.

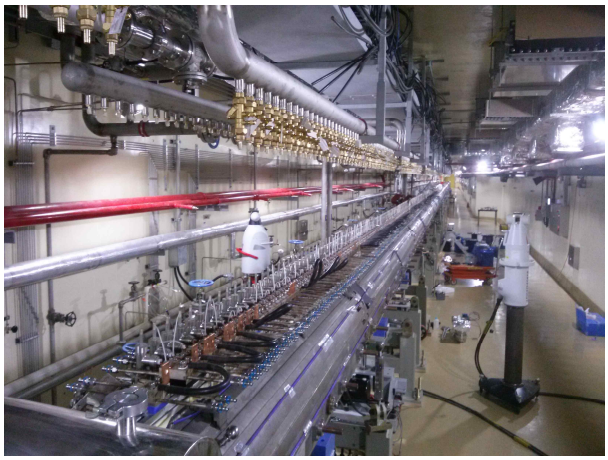


Fig. 5. DTL tanks were aligned in the tunnel by using two laser tracker systems. The position was monitored in real time.

3. Conclusions

The 100MeV proton linac was developed by the KOMAC according to the survey work and the alignment process. 100MeV proton beam will be supplied to the users after the beam commissioning.

Acknowledgment

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REFERENCES

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[2] 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.