

# Vacuum Test Results of PEFP 20 MeV DTL \*

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## 1. Introduction

The PEFP (Proton Engineering Frontier Project) 20 MeV DTL (drift tube linac) consist of 4 tanks have been installed at KAERI site [1]. All drift tubes are aligned at DTL tanks and then tanks are vacuum tested. The vacuum system configurations of tanks are identical. In this paper, the vacuum system layout and system test results will be presented.

## 2. DTL Vacuum System

### 2.1 System layout

The vacuum system configuration of tank is shown in figure 1. Two 300 L/sec turbo-molecular pumps with oil-free scroll pumps and two 300 L/sec sputter-ion pumps are installed in every DTL tank. The pressure requirement of DTL is  $3E-7$  mbar and the total gas load of tank is about  $5.5E-5$  mbar L/sec [2]. The Non-evaporable getter pumps are adopted to evacuated the high power window region because of the NEG is the most stable and efficient pump at the UHV pressure range. All components are controlled by the EPICS [4].

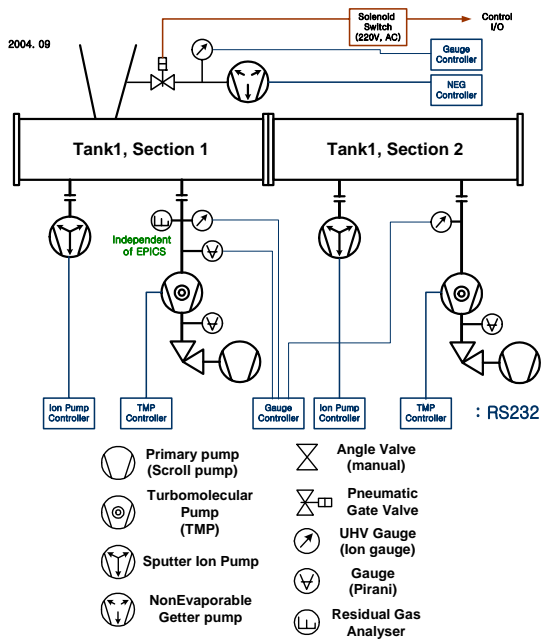


Figure 1. The vacuum system layout of 20 MeV DTL

### 2.2 Vacuum leak test

The drift tubes are e-beam welded each part and brazed with stem. All drift tubes are leak tested using Helium leak detector and the leak rate is under  $1E-10$  mbar L/sec.

The iris type of high power coupler jointed at alumina window is fabricated by steel and copper plated. All welding joints are Helium leak tested under  $1E-10$  mbar L/sec.

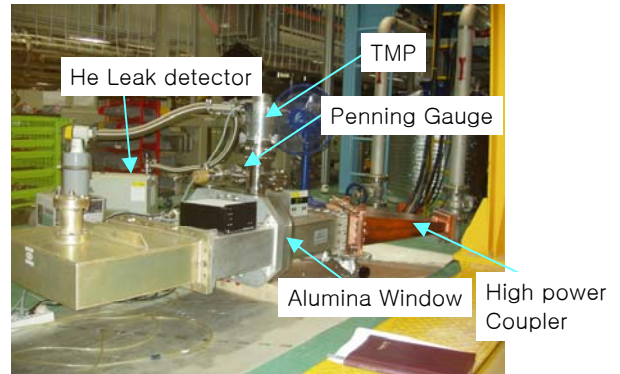


Figure 2. Leak test of High power window and coupler. The helium leak detector and the TMP are installed.

### 2.3 Drift tube installation

In Figure 3, DTL tank 1 that all drift tubes, tuning components, and the vacuum pumps are installed is shown. Every joints of tank and component is sealed with silver plated metal C-seal as RF sealant and viton o-ring as vacuum sealant [2-3].



Figure 3. PEFP 20 MeV DTL Tank 1.

Before the installation, all OFHC copper components – drift tubes, post couplers, and the vacuum grills – is cleaned as following procedures.

1. Deoxidize using scale remover composed of butoxy ethanol, ethyl glycol additives, organic compound and water.

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2. Rinse in cold de-mineralized water, 5 min.
3. Surface wiping with alcohol to remove the inorganic contamination
4. Rinse in cold de-mineralized water
5. Rinse in 2 vol. % acid composed of 80 % of sulphuric acid, 19 % of nitric acid, and 1 % of hydrochloric acid.
6. Rinse in cold de-mineralized water
7. Spray the acetone
8. Spray the alcohol
9. Air dry at room temperature

#### *2.4 Tank 1 Vacuum test*

After the installation of the drift tubes of tank 1, the tank was evacuated using a 500 L/sec TMP. The tank pressure after 20 hr evacuation is  $2E-6$  mbar. This is higher than the design pressure because of the some leaks are occurred at drift tube joints. So we change the sealants and reinstall the DTs. And also the gas load due to the outgassing of unbaked copper surface is higher than the designed value.

### **3. Conclusion**

The vacuum system for 20 MeV DTL is all ready and have been installing at tanks. The tank pressure is not satisfying the requirement to beam operation at this time. This vacuum condition will be improved by the gradual RF conditioning at low power and the baking of tanks if necessary.

### **REFERENCES**

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