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Engineering Design of the PEFP DTL II

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1. Introduction

The PEFP DTL II which accelerates a proton beam from the energy of 20MeV Beam to 100MeV is now under fabrication. The DTL II which has some similar specifications with the DTL which accelerates the proton beam to the energy of 20MeV is made of seamless carbon steel with Cu electroplating inside. The DTL tank is divided into 3 sections whose length is about 2.2m. We verified the mechanical and thermal stability using ANSYS code, and we established the fabrication process of the drift tube. The DTL II is now being fabricated.

2. DTL II Tank

2.1 General features of the DTL II Tanks

DTL II Tanks has similar features with DTL Tanks. The main difference is that the length of the DTL II tank is about 7m which is longer than the DTL tank. Considering the fabrication issue, the length of the tank section is limited to 2.5m, so the DTL II tank is divided into 3 sections compared to the DTL Tank which is composed of 2 sections[1]. The special features are summarized in table 1.

Table 1. Special features of the DTL II Tank

Material	Seamless carbon steel
Slug tuner	12
Vacuum port	6
RF pick up	5

2.2 Thermal analysis.

We verified the thermal stability and the thermal deformation of the Tank using thermal analysis code. RF duty was assumed as 9%. As shown in figure 1, the maximum temperature increase was 12° at the bottom of the tank. The increase of the tank diameter by the thermal deformation was 20µm. The frequency change due to the thermal deformation was expected as about 10kHz which is in the controllable range.

2.3 RF and vacuum seal structure of the stem and post coupler

We designed the rf and vacuum seal structure as shown in figure 3. We will use 1 RF seal and 2 viton O-ring for the stem and post coupler. For the alignment of the drift tube, the seal structure of the stem used 2 spacers.

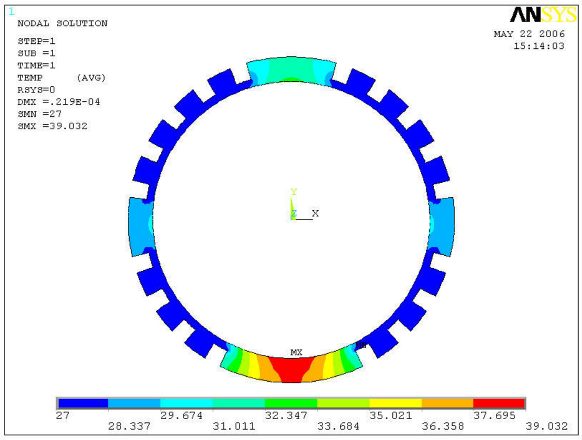

Figure 1. Temperature increase of the Tank

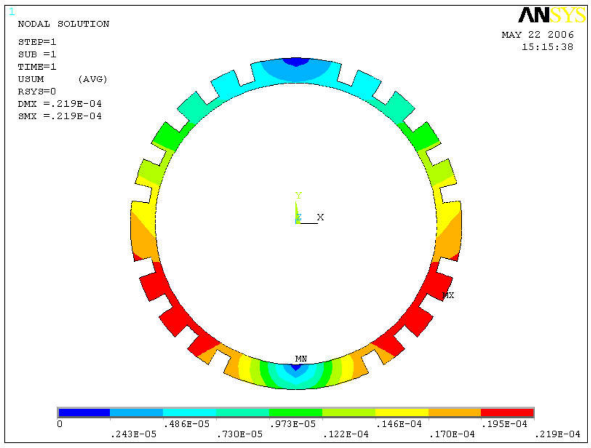

Figure 2. Thermal deformation of the Tank

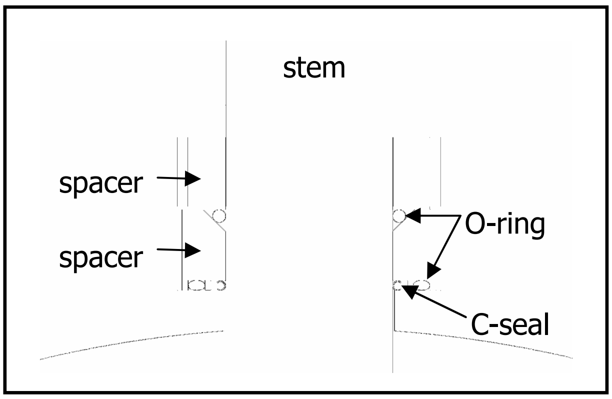

Figure 3. The design of seal structure of the stem

The advantage of this system is that we can define the compression of the RF seal and vacuum seal exactly after tighten the thread.

2.4 Vacuum grill

We design the vacuum grill which is made of OFHC. We verified the thermal stability of the vacuum grill. As shown in figure 4, the maximum temperature increase was just 4°, so there will be no problem in operation

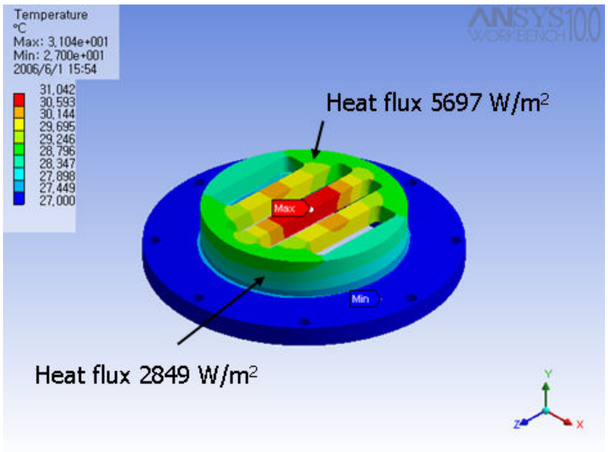

Figure 4. Thermal analysis result of the vacuum grill

3. Summary

The Engineering design of the DTL II Tank was successfully done. DTL II tank is now under fabrication.

4. Acknowledgements

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Reference

[1] M.Y. Park et al, Proceedings of EPAC 2004, 'Fabrication status of the PEFP 20MeV DTL'