Contribution ID: **54** Type: **Contributed Oral Presentation**

Theoretical analysis and experimental investigation on performance of the thermal shield of accelerator cryomodules by thermo-siphon cooling of liquid nitrogen.

Tuesday 30 June 2015 11:15 (15 minutes)

Five beam line cryomodules with total 27 superconducting RF cavities are installed and commissioned at IUAC to enhance the energy of heavy ion from 15 UD Pelletron. To reduce the heat load at 4.2 K, liquid nitrogen cooled intermediate thermal shield is used for all these cryomodules. For three linac cryomodules, concept of forced flow LN2 cooling is used and for superbuncher and rebuncher, thermo-siphon cooling concept is incorporated. It is noticed that the shield temperature of superbuncher varies from 90 K to 110 K with respect to liquid nitrogen level. The temperature difference can't be explained by using the basic concept of thermo-siphon with the heat load on upstream pipe. A simple thermo-siphon experimental set up is developed to simulate the thermal shield temperature profile.. Mass flow rate of liquid nitrogen is measured with different heat load on upstream pipe for different liquid level. It is noticed that small amount of heat load on downstream pipe have a significant effect on mass flow rate. The present paper will be investigating the data generated from thermo-siphon experimental set up and a theoretical analysis will be presented here to validate the measured temperature profile of the cryomodule shield.

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Session Classification: C2OrC - Pulsating Heat Pipes and Thermosyphons

Track Classification: CEC-12 - Fluid Mechanics, Heat Transfer, and Cryogen Properties