XENON RECOVERY CRYOSTAT FOR EXPERIMENT E–781 AT FERMILAB

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As known Xenon is very expensive gas and therefore Xenon recovery cryostat was designed for its separation from the mixture of Xe + 30Methane on the outlet of the Transition Radiation Detector(TRD) in the experiment of E–781 at Fermilab, US. There is a major requirement for the Xenon recovery cryostat: its influence on the TRD's characteristics must be excluded.

The main design features of Xenon recovery cryostat are shown in Fig. It has two stages of Xenon separation working at the temperature of 163K and 113K. Dividing the second stage in two vessels(A and B) working at the first stage temperature by turns gives a possibility of Xenon removal from the two stages of cryostat during its run with the TRD.

As the cooling source a liquid nitrogen is used which is filled into the 20 litters vessel through one of the two pipes.

The mixture from the TRD passes through the vertical heat exchanger into the first stage vessel and is precooled with Nitrogen gas coming out from the first stage heat exchanger. Liquid Xenon is collected by the first stage vessel.

It should be noted that each vessel has his own heat exchanger connected to the bottom of 20 litters liuquid Nitrogen vessel via the 3x0,5mm copper pipes. The outlet pipes of heat exchangers are connected to his own pressure(temperature) controllers(PIC-1, PIC-A, PIC-B) on the cryostat tor.

As the second stage vessels(A and B) are supported at the temperature of 113K, Xenon is kept in the solid state [1]. If there is a need to transform quickly solid Xenon into liquid one, the heaters fixed on the vessels bottoms may be used.

As the temperature control system of stages the gas control system is used. The first stage gas thermometer is filled with pure Xenon and the second ones - pure Methane.

To prevent the cryostat influence on the TRD's characterstics the vent line is installed on the pipe connecting the cryostat with the TRD.

The experimental performances of Xenon recovery cryostat are the following:

— liquid Nitrogen consumption	— 4 liters/day,
— cooling time of cryostat	— 5 h,
— flow rate of Xe + 30% Methane mixture	— 10–100ccm/min,
— Xenon losses	— 1% (TRD's losses not included)

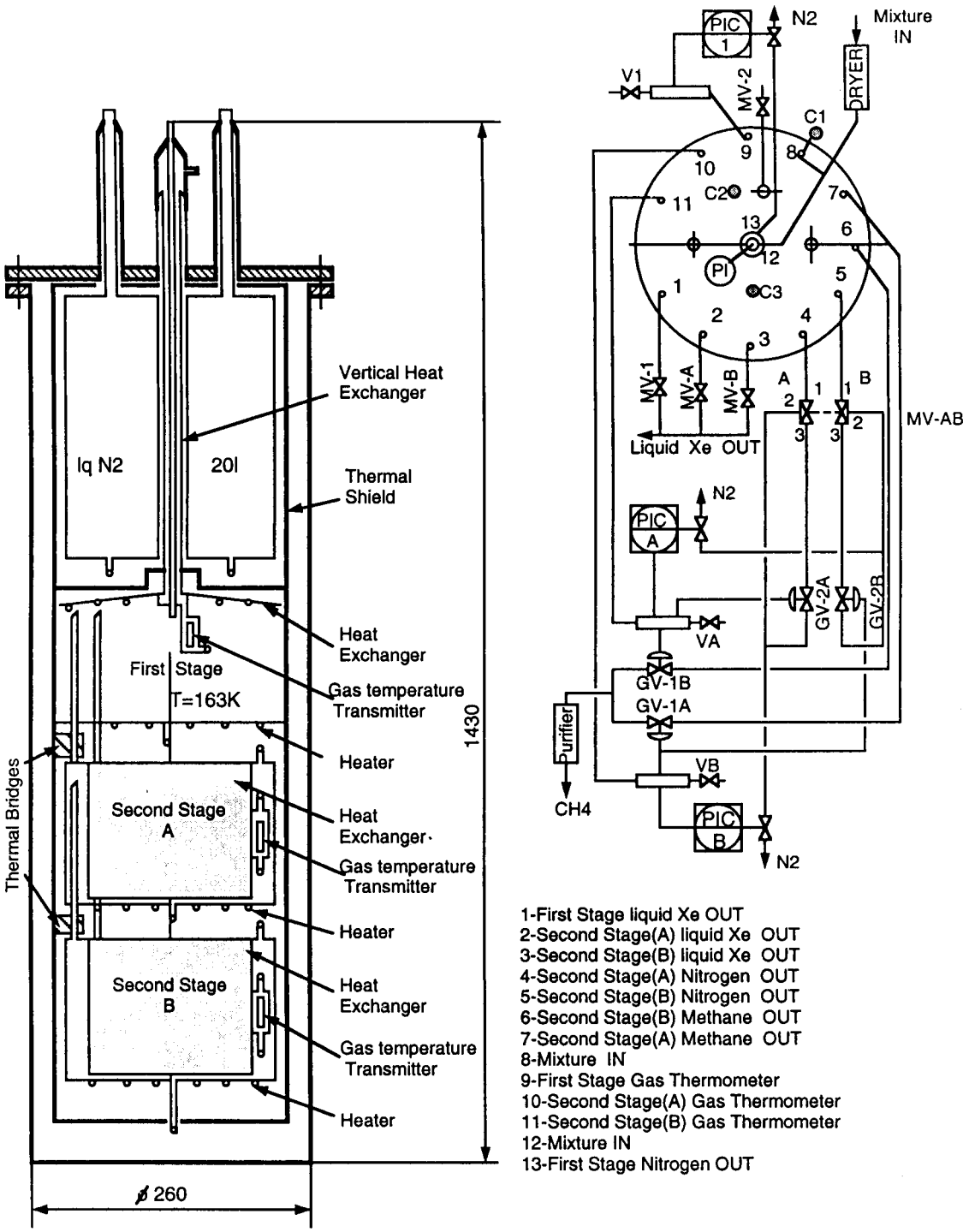

Fig. Xenon Recovery Cryostat