
SESSION 11: Special Topics

Paper 11.3 Wednesday POSTER Session 1:15 to 2:45 PM

Achievement of 120 W at 80 K by Synchronous Operation of Two Single-Stage G-M Cold Heads Driven by a 2 kW Class Compressor

S. Masuyama, NIT, Oshima College, Yamaguchi, Japan; and K. Natsume, K. Kamiya, and T. Numazawa, NIMS, Ibaraki, Japan

In order to improve the cooling capacity and efficiency of a Gifford-McMahon (G-M) cryocooler, the synchronous operation of two single-stage G-M cold heads driven by a 2 kW class compressor was experimentally investigated. The pair of flexible hoses was branched into two pairs near the compressor, and then two pairs of hoses, each 10 m long, were connected to each cold head. Two synchronous modes, in-phase and reverse phase, were carried out. In the in-phase mode, two vertically moving displacers of the G-M cold heads reach top and bottom dead center simultaneously. In the reverse phase mode, when one of the displacers reaches top dead center, the other simultaneously reaches bottom dead center, and vice versa. The experimental results showed that two synchronous modes had almost the same cooling capacity in the measured temperature range. The maximum cooling capacity achieved was 123 W at 80 K, which was 1.4 times larger than that of a single cold head operated with the same compressor. The relative Carnot efficiency was calculated to be 16%. These results prove that synchronous operation of two G-M cold heads is highly efficient at the temperature of liquid nitrogen.