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Development of 52 kA HTS Current Leads for the ITER CS Magnet Test Application

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Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP) was contracted by General Atomics Company to develop a superconducting feeder system containing a pair of 52 kA high temperature superconducting (HTS) current leads for ITER Central Solenoid CS magnet test. These HTS current leads are majorly based on the previous ITER lead design experiences. However, the vertical assembly design which is different from ITER horizontal assembly causes the water leakage in the insulation flange during the initial phase. Some improvement was recognized and avoids the potential risk for further prototypes and series production of ITER leads. Some development experience will be shared in the paper. The HTS current leads contain Bi-2223 AgAu tapes to minimize the heat load to 4.5 K end. Its resistive part is cooled by 50 K helium. The HTS part is cooled by conduction. The HTS current leads were integrated in the feeder system to perform 4.5 K full current test. The factory acceptance test was implemented to verify the high voltage and thermodynamic performances. The maximum current was achieved at 55 kA. The test indicates the helium mass flow consumption is 3.3 g/s per lead, and loss of flow accident (LOFA) time is close 10 minutes at the nominal current with the stoppage of 50 K helium. The insulation flange passed the high voltage test of 15 kV with less than 1 micro Ampere leakage current after the improvement. More detailed test results will be shown in the paper. The development of the whole feeder system for CS magnet test will be contributed on the different paper presented at this conference.

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