



Contribution ID: 1328 Contribution code: MOPA184

Type: **Poster Presentation**

Normal-conducting 5-cell cavities for HEPS booster RF system

Monday, 8 May 2023 16:30 (2 hours)

The booster ring of High Energy Photon Source is responsible for ramping the beam energy from 500 MeV to 6 GeV. Six 5-cell copper cavities of PETRA-type were chosen to provide a total accelerating voltage of 8 MV. To fulfill the specific requirements of the HEPS booster, several modifications were made on the original design from Research Instruments (RI). Six cavities manufactured by RI have been delivered to HEPS and high-power tested successively from April to December 2022. Cavities were tested up to a maximum rf power of CW 120 kW, which is the reliable capability of the power coupler specified by RI. Power-keeping at the maximum rf power was conducted subsequently, with an average time of 100 hours. Finally, in order to verify the performance during real operation, the ramped run was conducted according to the pre-defined curve required by the physics design at a repetition rate of 1 Hz, with all control loops closed (cavity frequency loop, cavity field amplitude/phase loop, amplifier amplitude/phase loop). Details on the design modifications, the low-power test, the high-power conditioning and the ramped commissioning are presented in this paper.

Funding Agency

This work was supported in part by High Energy Photon Source, a major national science and technology infrastructure in China and in part by the Chinese Academy of Sciences.

Footnotes

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Session Classification: Monday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.A05: Synchrotron Radiation Facilities