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High Q and high gradient performance of the first medium-temperature baking 1.3 GHz cryomodule

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The world's first 1.3 GHz cryomodule containing eight 9-cell superconducting radio-frequency (RF) cavities treated by medium-temperature furnace baking (mid-T bake) was developed, assembled and tested at the Institute of High Energy Physics (IHEP), Chinese Academy of Sciences for the Dalian Advanced Light Source (DALS). The 9-cell cavities in the cryomodule achieved an unprecedented high average intrinsic quality factor (Q0) of 3.8E10 at 16 MV/m and 3.6E10 at 21 MV/m in the horizontal test. The cryomodule can operate stably up to a total continuous wave (CW) RF voltage greater than 191 MV, with an average cavity usable accelerating gradient of more than 23 MV/m. The results significantly exceed the specifications of DALS and the other high repetition rate free electron laser facilities (LCLS-II, LCLS-II-HE, SHINE, S3FEL etc.). This paper reviews the cryomodule performance and discusses some important issues in cryomodule assembly and testing.

Footnotes

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