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25.1T generation in 25T cryogen-free superconducting magnet with a modified Bi2223 insert

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In 2015, we achieved 24.6 T by the 25T cryogen-free superconducting magnet (CSM) with a Bi2223 insert. Then it has been used as a user magnet at High Field Laboratory for Superconducting Materials, IMR, Tohoku University. The Bi2223 insert consists of 38 double pancake coils with high strength Ni-alloy/ Bi2223 tapes (Sumitomo type HT-Nx) [1]. In this case, we used turn separation in the middle section (52-185 turn in 257 turns) of the Bi2223 pancakes to reduce the maximum hoop stress. However, the problem of short circuit in a part of Bi2223 pancake was found related to the weak stiffness of turn separated pancakes. Then we modified the Bi2223 pancakes to mechanically separated 5 section pancakes, in order to improve those stiffness. Finally, the 25.1 T can be generated with an 1 hour ramping time. In the new 25T-CSM, the maximum stress in the Bi2223 insert could be decreased and the number of spike noises under ramping are much reduced. Previous problems, modified design, operation results and magnetic field stability will be presented in the presentation.

References

[1] S. Awaji et al., Supercond. Sci. Technol. 30 (2017) 065001.

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