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Design of photonic band gap superconducting cavity working at 3.9 GHz

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RF superconducting cavities have been widely used in accelerators. The higher order modes caused by the wakefield radiation will lead to the beam instability, which is very harmful. So, it is necessary to depress the higher order modes. The photonic band gap (PBG) structure can effectively absorb higher order modes and suppress wakefield radiation. In addition, PBG cavities based on PBG structures have the advantage of adding waveguide ports directly to the cavity wall. Therefore, the PBG cavity can be used directly as a coupler, instead of the coupler attached to the end cell. So far, the PBG cavities have been tested and validated. On this basis, a PBG cavity working at 3.9 GHz was designed, and a couple of waveguide couplers are added to the cavity to ensure that all dangerous higher order modes in the cavity can be exported. After that, we used the CST microwave studio to calculate the electromagnetic parameters of the cavity. Accordingly, Q0=11488, Qe=1.149×1011, Eacc = 8.159×107, and Epeak/Eacc = 2.317.

Footnotes

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