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## Study and simulation of cryogenic bi-periodic accelerating structure with TM<sub>02</sub> mode

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To further enhance the accelerating gradient of accelerators, we designed a cryogenic C-band standing wave bi-periodic accelerating structure for the Shanghai Soft X-ray Free Electron Laser Facility (SXFEL). According to the low-temperature environment, material characteristics and technological conditions, the design is completed and it is decided to design the accelerating structure into a bi-periodic magnetic coupling structure. It is a 17-cell structure consisting of 9 accelerating cavities and 8 coupling cavities. To guarantee the symmetry of the field, the structure is doubly-fed. Operating with the  $\pi/2$  mode standing wave, it is much less sensitive than the standing-wave structure of  $\pi$ -mode. Additionally, the microwave mode is TM<sub>02</sub> in coupling cavities that are larger and even less sensitive than the traditional bi-periodic structure. The shape of the coupling cavity can be redesigned to make it tunable.

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### Footnotes

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