Institute of Applied Electronics

China Academy of Engineering Physics

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Progress of the 2x4-cell Superconducting accelerator for the CAEP THz-FEL facility

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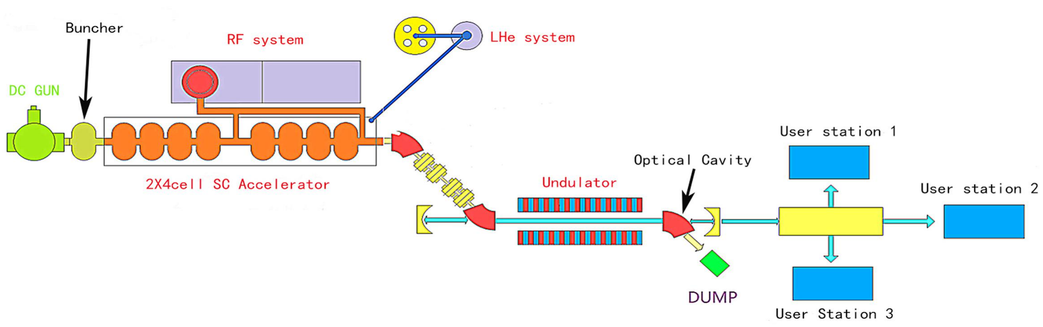
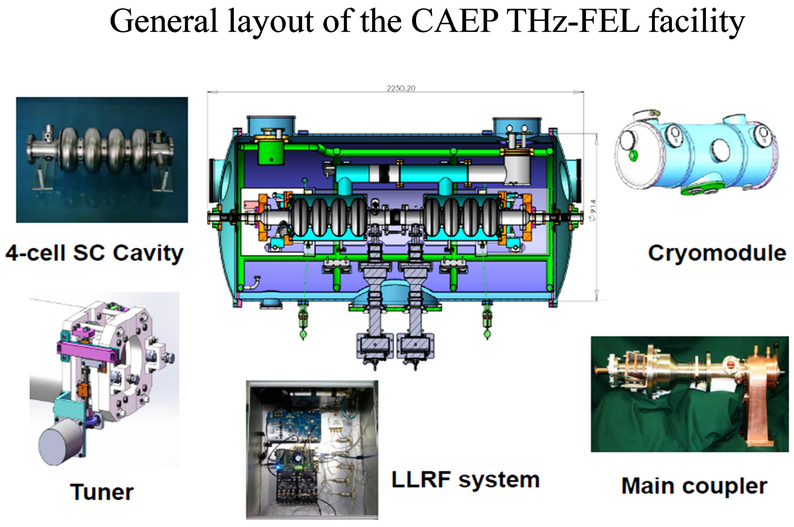
Abstract

The high average power THz radiation facility is now under construction in China Academy of Engineering Physics. The superconducting accelerator is one of the most important components for this facility, including two 4-Cell TESLA superconducting radio frequency cavities. The designed effective field gradients for both cavities are 10-12 MV/m. This paper will present the progress of the 2x4-cell superconducting accelerator, mainly including its construction and cryogenic test in Chengdu. At 2 K state, the cryomodule works smoothly and stably. The effective field gradients of both cavities have achieved 10 MV/m. Further beam loading experiments are now in progress.

Introduction



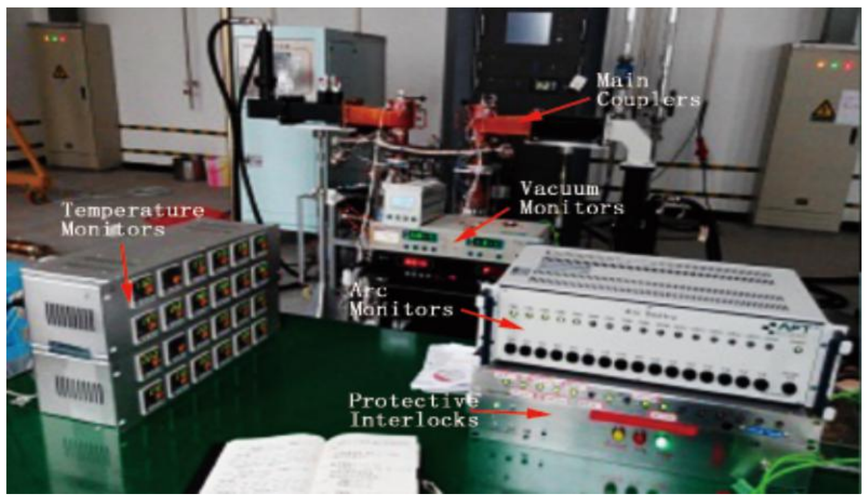
General layout of the CAEP THz-FEL facility



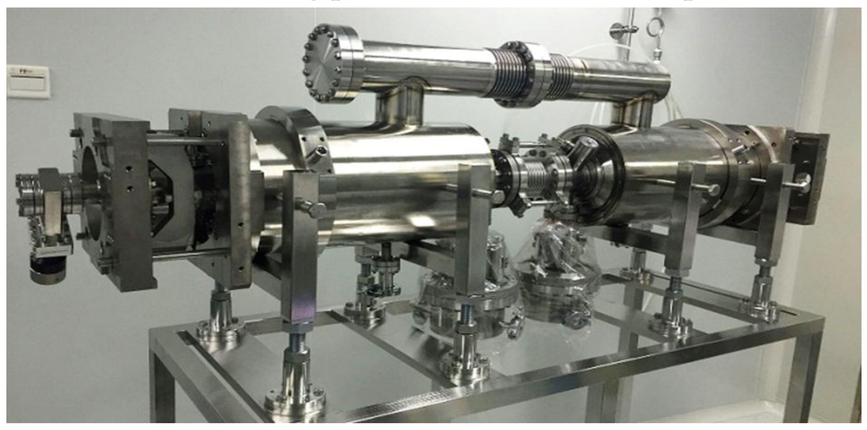
The cross-section and components of the superconducting accelerator

Designed energy gained: **6~8 MeV,** Designed effective field gradient: **10~12 MV/m**.

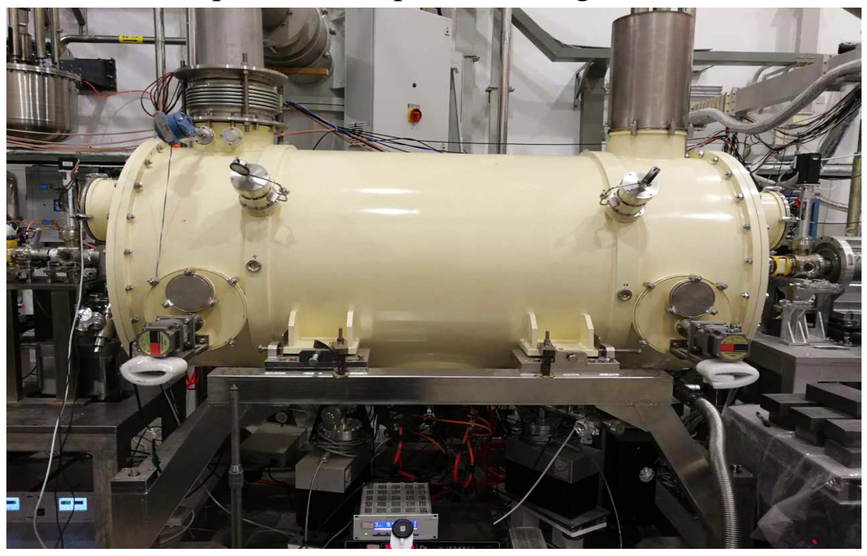
Construction



The conditioning platform of the main couplers

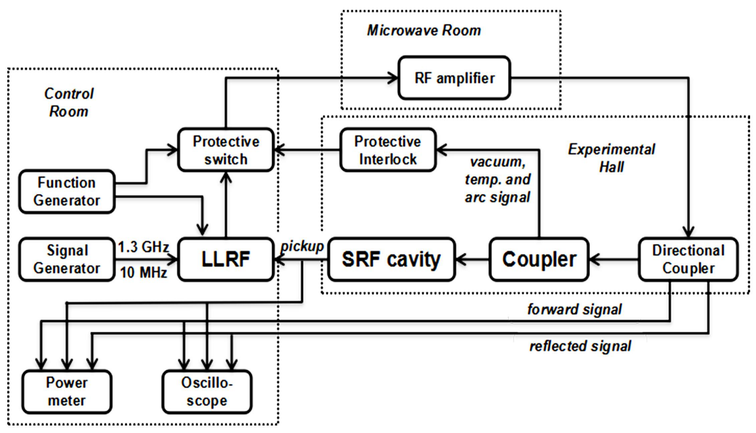


The axis part of the superconducting accelerator

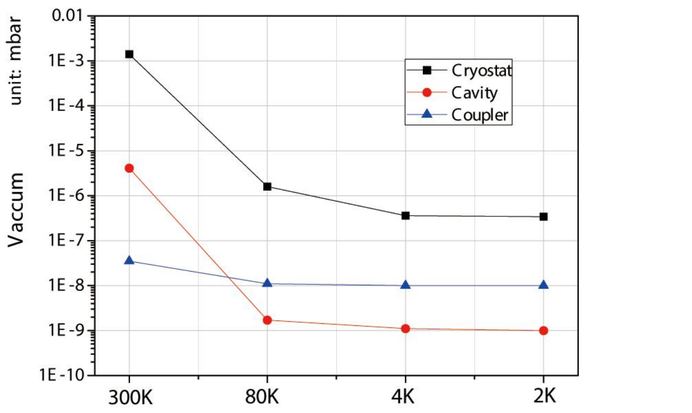


The superconducting cryomodule after assembly

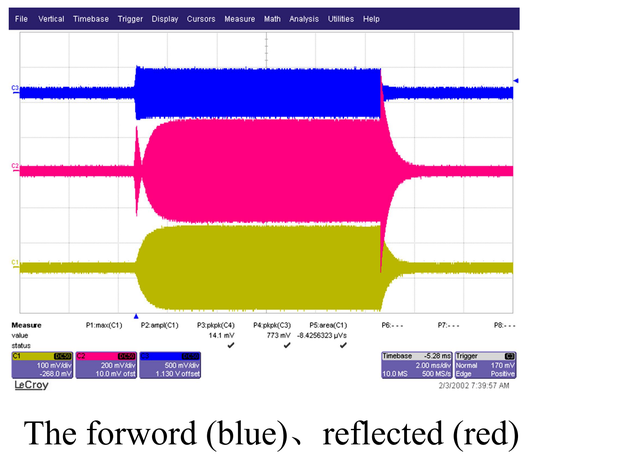
Cryogenic test



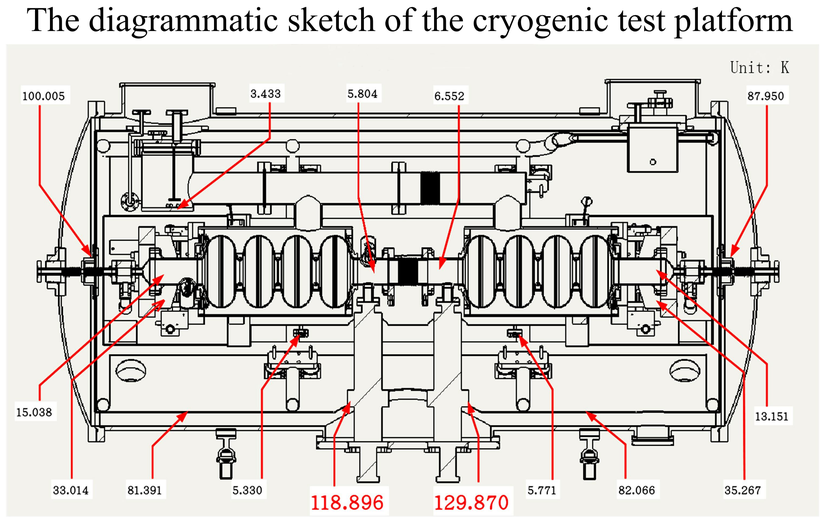
The diagrammatic sketch of the cryogenic test platform



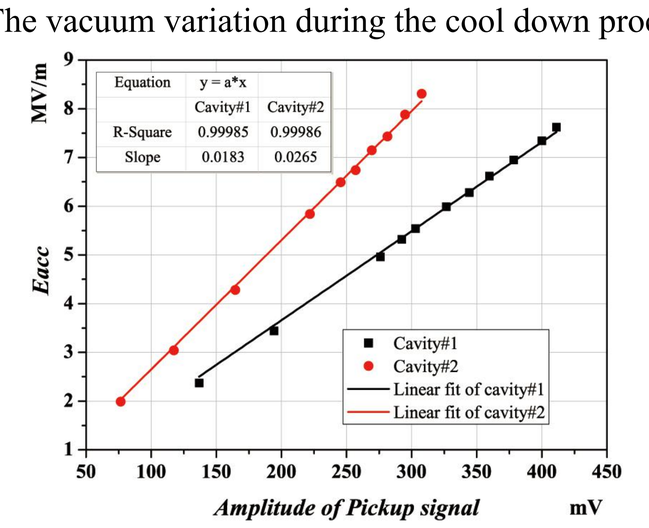
The vacuum variation during the cool down process



The forword (blue)、reflected (red) and pickup (yellow) signals at 4 K



The temperature distribution of the cryomodule at 2 K state



The relationship between E_{acc} and V_{pickup} at 4 K

At 2 K state, the superconducting accelerator works smoothly and stably. The effective field gradients of both cavities have achieved **10 MV/m**, which have satisfied our designed goal. The LLRF system works in AP mode and the amplitude and phase stability of LLRF is 0.06% and 0.03°。