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Towards high brightness accelerators —- research of the cryogenic electron gun

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The current trend in accelerator facilities is to increase the beam brightness, which places higher demands on both the electron gun and the acceleration unit. With high shunt impedance and expected gradient, cryogenic structure has the ability to provide beam with high peak brightness and has the potential to operate at a higher repetition rate. In SSRF/SXFEL, the scheme and preliminary experimental studies about the cryogenic RF structure have been developed. Foremost, theoretical and experimental studies of the RF characteristics in cryogenic environments are investigated. Then the study of beam dynamics and the RF design of the cryogenic gun, as well as the fabrication of the gun are performed. An upgraded prototype of the electron gun with the cryostat, which can make the gun compatible with the beam has been designed. In the subsequent study, we will work on the high power experiment of the cryogenic gun, and continue developing cryogenic acceleration units.

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