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Temperature stability in CrYogenic Brightness-Optimized Radiofrequency Gun (CYBORG)

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X-ray free electron lasers (XFEL) and other x-ray producing light sources are large, costly to maintain, and inaccessible due to minimal supply and high demand. In addition, concepts for future electron colliders benefit from cost reduction size is reduced through normal conducting RF cavities are operated at very high gradients. It is advantageous then to consider miniaturizing electron linacs through a variety of means. We intend to increase beam brightness from the photoinjector via high gradient operation (>120 MV/m) and cryogenic temperature operation at the cathode (<77K). To this end, we have fabricated a new 0.5 cell CrYogenic Brightness-Optimized Radiofrequency Gun (CYBGORG). CYBORG serves three functions: a stepping stone to a higher gradient cryogenic photoinjector for an ultra-compact XFEL (UCXFEL); a prototype for infrastructure development useful for concepts such as the Cool Copper Collider (Cˆ3); and a test bed for cathode studies in a heretofore unexplored regime of cryogenic and very high gradient regime relevant for the National Science Foundation Center for Bright Beams. We present here commissioning status of CYBORG and the associated beamline focusing in particular on C-band RF power development and thermal balancing of the gun in the cryogenic environment.

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Footnotes

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