High-Gradient Short Pulse Accelerating Structures

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Introduction

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11.7 GHz Extractor for AWA Experiment

High gradients are necessary for lots of applications of electron accelerators. As the maximum gradient is limited by effects of RF breakdown, we present a development of an electron accelerating structure operating with a short multi-megawatt RF pulse. The structure exploits an idea to decrease the breakdown probability due to RF pulse length reduction. This concept requires to distribute RF power so that all accelerating cells are fed independently each other. This implies waveguide net system which allows to delay and to distribute properly RF radiation along the structure keeping synchronism of particles and waves. We have designed an X-band pi-mode structure including the RF design, optimization, and engineering. The structure will be tested as an RF power extractor at the Argonne Wakefield Accelerator Facility for two-beam acceleration experiments. In this regime we anticipate to obtain 10 ns, gigawatt power level RF pulses generated by train consisted of eight 25-50 nC relativistic bunches.



Short Pulse Accelerating Structure with Side Coupling



Side coupled structure with power combiner

4E+08

3.6E+08

3.2E+08

2E+08

1.6E+08

1.2E+08

8E+07

4E+07







