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Progress in High Power Millimeter-Wave FELs with Short Period Wigglers and Sheet Electron Beams*

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We will report on the status of our program to develop a high average power (0.1 - 1.0 MW), millimeter-wave ($0.5 \text{ mm} \leq \lambda \leq 2.0 \text{ mm}$) FEL using a short-period wiggler ($0.5 \text{ cm} \leq \ell_w \leq 1.5 \text{ cm}$) and a sheet electron beam ($V_b \leq 1 \text{ MV}$). Results on the transmission of wiggler-focused sheet beams through narrow waveguide gaps will be presented, including detailed theoretical simulations and experimental measurements of body currents. We will describe FEL design improvements yielding negligible rf wall losses and substantially reduced body currents. In addition, recent achievements in wiggler magnet development and two proof-of-principal FEL experiments will be discussed.

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