Here we report the results of an experimental study of the saturation dynamics and the optimal conditions for maximal radiation power extraction in a free electron laser (FEL) oscillator. The study was conducted on the Israeli electrostatic accelerator free electron laser (EA-FEL) that is capable of providing lasing pulses at frequencies between 95-110 GHz (depending on the electron beam energy). A critical parameter affecting the performance of the laser is the reflectivity and transmission of the out-coupling element of the resonator. Varying this parameter was made possible by attaching a remote-controlled variable reflectivity out-coupling element (based on a series of wire-grid polarizers) to the resonator of our EA-FEL. As in any laser oscillator the conditions for maximum power emission are the results of a balance between the counteracting effects of increased internal reflectivity (loaded Q) that enhances the stored energy as opposed to increasing the out-coupling coefficient (thereby reducing the reflectivity) in order to increase the portion of out-coupled power relative to internal loss. The power optimization conditions were studied by us for the case of an FEL oscillator along with optimization conditions for other performance parameters specific to FEL, such as maintaining fast single-mode establishment in the resonator and sustaining single-mode long lasing pulses.