A Matrix Method for the Optimization of Nonlinear Quadrupole Focusing System[*], A. DYMNIKOV, G. MARTINEZ, Dept. Física Aplicada III, Fac. de Física, U.C.M. 28040, Madrid, Spain - The optimization matrix method is proposed and described for studying focusing systems which produce for a given beam current the smallest beam spot size on the target. The use of this method is illustrated in the optimization of the nonlinear quadrupole focusing system which is an essential part of a microprobe and determines the microprobe resolution. We consider the differential equation of motion of the particles accurate to terms of third order inclusive. Before the investigation of the nonlinear equation of beam motion, we are solving the linear equation. For each geometry of the system we find the excitation of the lenses and the demagnification. For solving the nonlinear equation we use the matrix method of embedding in the space of phase moments. In this method the initial approximate differential equations are replaced by the linear equations in the space of the phase moments with the same accuracy. The minimum spot size and the appropriate initial beam radius for different emittances are found and plotted.

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