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P05 - Five magnetic quadrupole lenses with four separated power supplies as one stage probeforming system of nuclear microprobe

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The present work is aimed at creating new types of microprobe systems by means of upgrade of existing ones. We propose one stage probeforming system with five magnetic quadrupole lenses and four power supplies. First two lenses with separated supplies are single unit doublet [1], which is easy to adjust. A final three lenses are a conventional high excitation triplet, which also have two supplies. For such pentuplet an optimization problem was solved in order to get at the target a probe with the best parameters. Excitation for the triplet was specified by a condition of stigmatic beam focusing. Free parameters determined during the optimization were values and variants of a doublet excitations and its position along a beam line. The optimization criteria was based on a maximum normalized acceptance –acceptance normalized to value of a given probe size.
The results of our numerical simulation have shown that proposed pentuplet has more than twice higher maximum normalized acceptance than conventional triplet. Regimes when the system has demagnification coefficients equal in x and y directions and in four times greater than triplet demagnifications for the same normalized acceptance are determined.
The analysis also confirms that the value of the system acceptance increases with a decrease in the working distance. At the same time a position of the single unit doublet along beam line effects insignificantly on the characteristics of probeforming system. Advantage of using single unit doublet as the first two lenses at the pentuplet is confirmed by calculations of tolerances for lens positioning accuracy.

[1] V.A. Rebrov, A.G. Ponomarev et al. Nucl. Instr. and Meth. B 260 (2007) 34.

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