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BEAM OPTICS AND MAGNET STUDIES FOR NEUTRALIZER STORAGE RINGS (NSR)

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We have 3 design phases

1) Linear stability of the closed reference orbit, with transfer map Mx and My

$$-2 < \mathrm{Tr}\, M_x < 2 \quad , \quad -2 < \mathrm{Tr}\, M_y < 2$$

2) 3D simulation of pole and fringe field effect (see figure 7)

3) Dipole and inflector detailed design; many particle orbit calculated with D0 conversion; beam space charge, trapping or clearing of secondary ions, ..

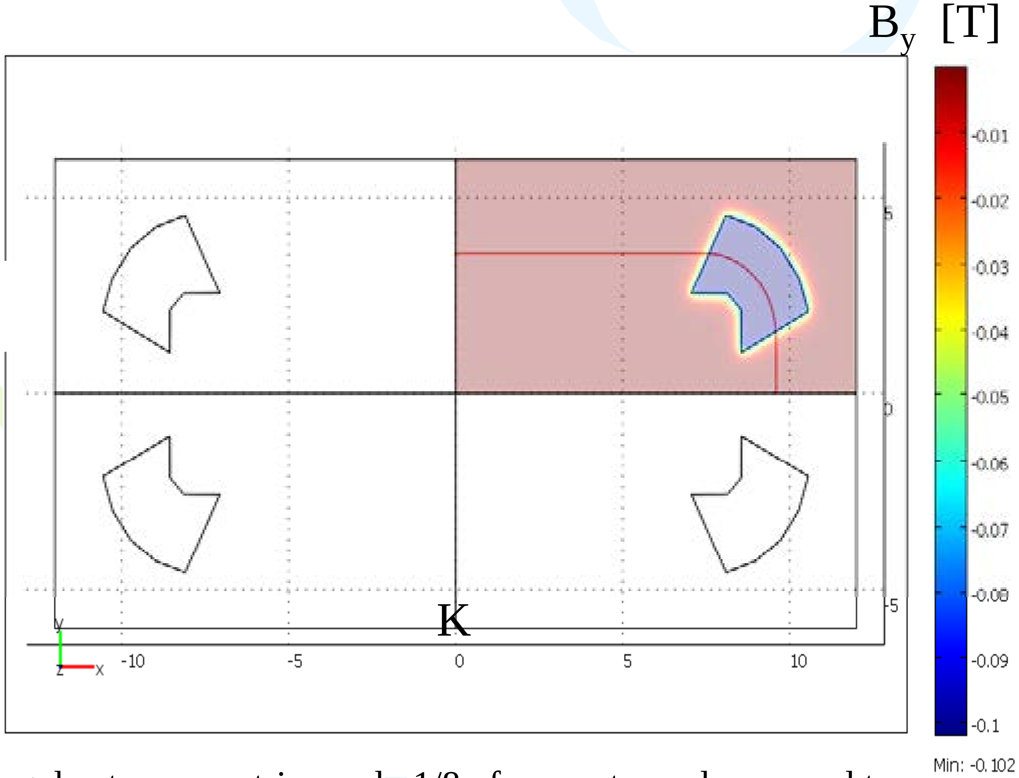
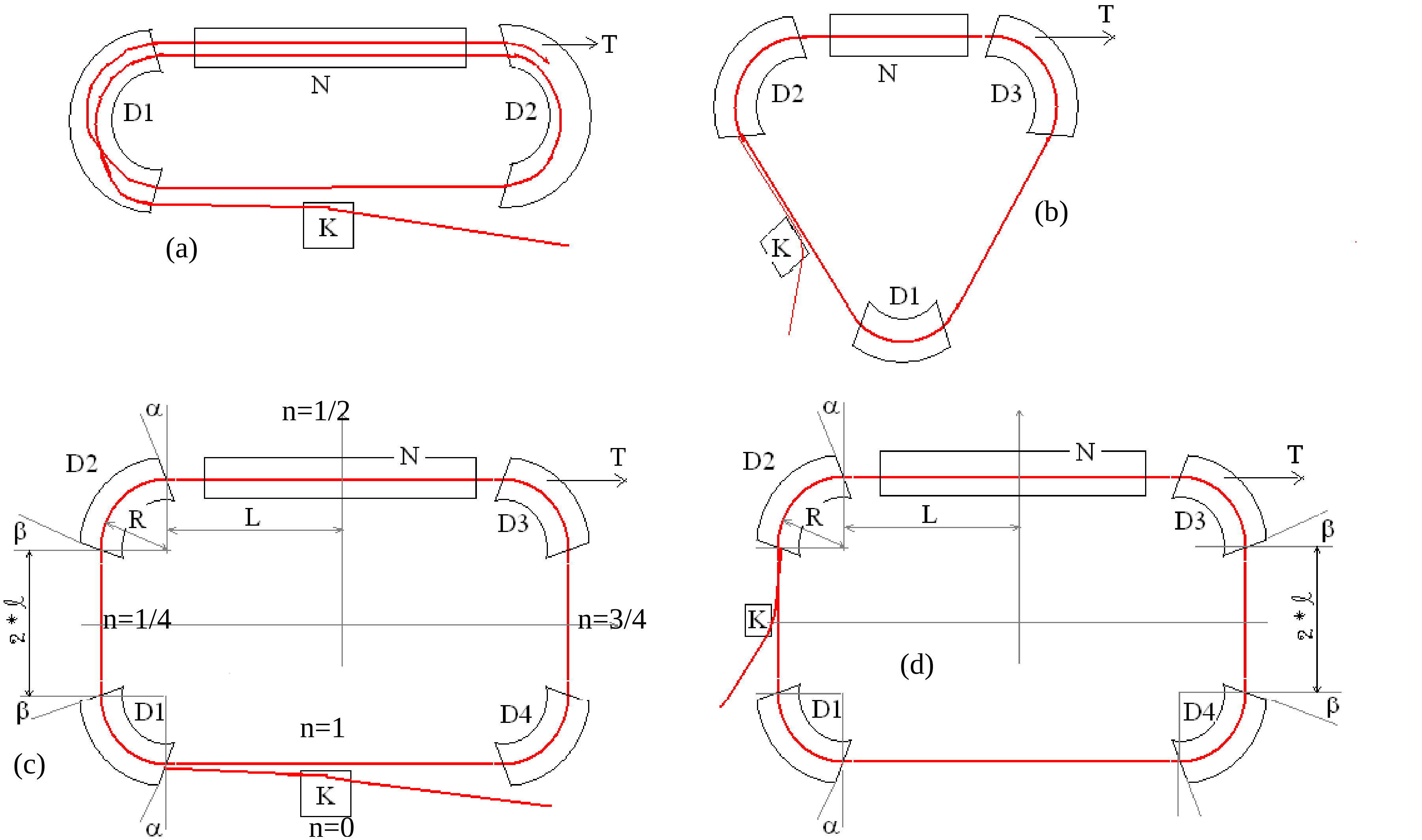


Figure 7: color map of By for M=4 dipole storage ring due to symmetries, only 1/8 of apparatus volume need to simulated; this applies also to reference orbit, provided that dipole current is adjusted to get perpendicular crossing of symmetry planes. Position of inflector K is approximately marked



$\ell = 0.8R \quad , \quad L = 3.8R \qquad t_a = t_b = 0.52 \qquad t_a = \tan\alpha \quad , \quad t_b = \tan\beta \quad ,$

Figure 2: a) the lattice (magnet and beam path scheme) of fig. 1, with a different injection at K (inflector steerer); T is tokamak receiving neutral D^0 from neutralizer N; here number M of main dipoles is M=2. b) a different lattice, with triangular symmetry and M=3; c) the rectangular lattice (that is M=4), with some notation: R bending radius, D1, D2, D3 and D4 dipole magnets, ℓ and respectively L are half lengths of the short and long straight sections; α and β are entrance/exit angles (note that angles of size β are adjacent to short secion for rectangular symmetry); d) the rectangular lattice as before, but with injection on short section. Other polygonal lattice (with M>4 and/or different bending angles) may be also considered; the square lattice is as 'd', but with ℓ=L . Note the turn number n, and its origin n=0.