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BEAM ENVELOPE ON THE FEL QUADRUPLETE BEFORE THE WIGGLER. COMPARING "TRANSPORT" and "ELOP" RESULTS.

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Beam envelope on the FEL region: Diagnostic Screen 1 - Quadrupoles Q1÷Q4 - Diagnostic Screen 2 - 600mm drift space (without wiggler fields) was simulated using codes "ELOP" and "TRANSPORT" (first order approximation) for the following quadrupole gradients: Q1=2.275Gs/mm (1.495A), Q2= - 1.895Gs/mm (-1.245A), Q3=2.245Gs/mm (1.475A), Q4= - 1.492Gs/mm (-0.98A). Quadrupole current means was took from experiment (A.Abramovich, 18.01.98). Sign "+" suits to focusing in the x-direction. Other parameters for simulations are: distance between Screen 1 and Q1 is 200mm, effective length of the quadrupoles is 140mm, radius of the quadrupole aperture is 40.5mm, beam energy is 1.4MeV, initial beam radius is 7.5mm and beam divergence in both x and y directions is 2.93 mrad. TRANSPORT code is desined for ultrarelativistic beams. To use it in our case angle calibration in the bending dipole magnetic field was made and relativistic factor γ was taken into account by means of beam energy changes. So, 1.4MeV in the ELOP suits to 1.8445MeV in the TRANSPORT. The results of simulations are shown on the Fig.1-2.

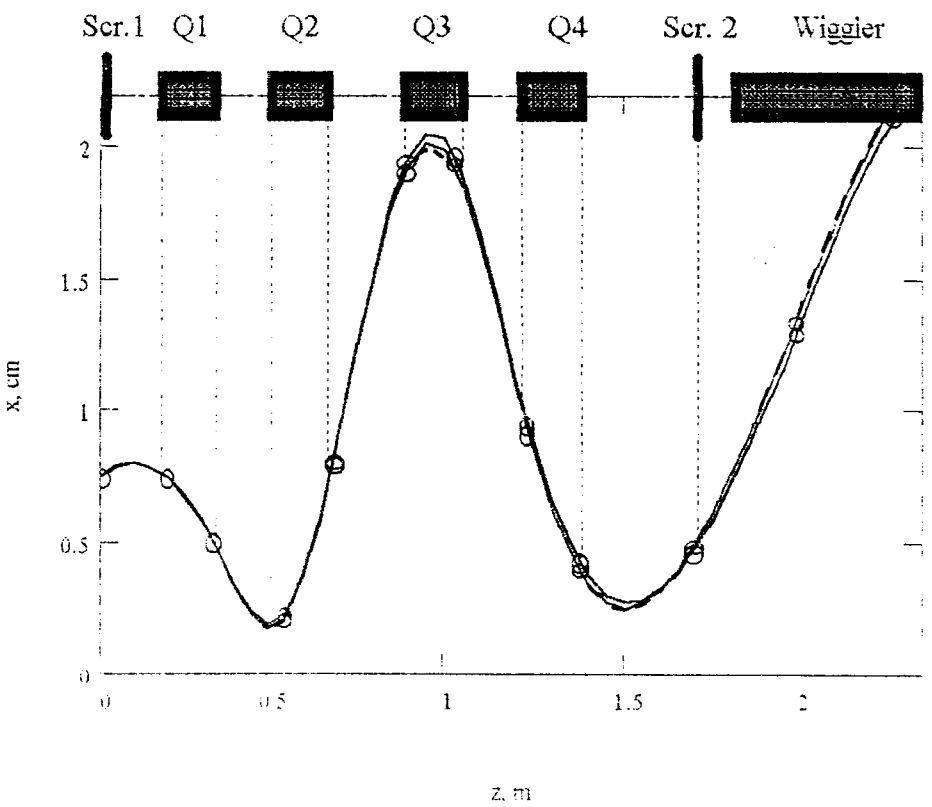

Fig. 1. Beam envelope in x-direction on the FEL quadruplet region. Continuos line - TRANSPORT, dashed line - ELOP.

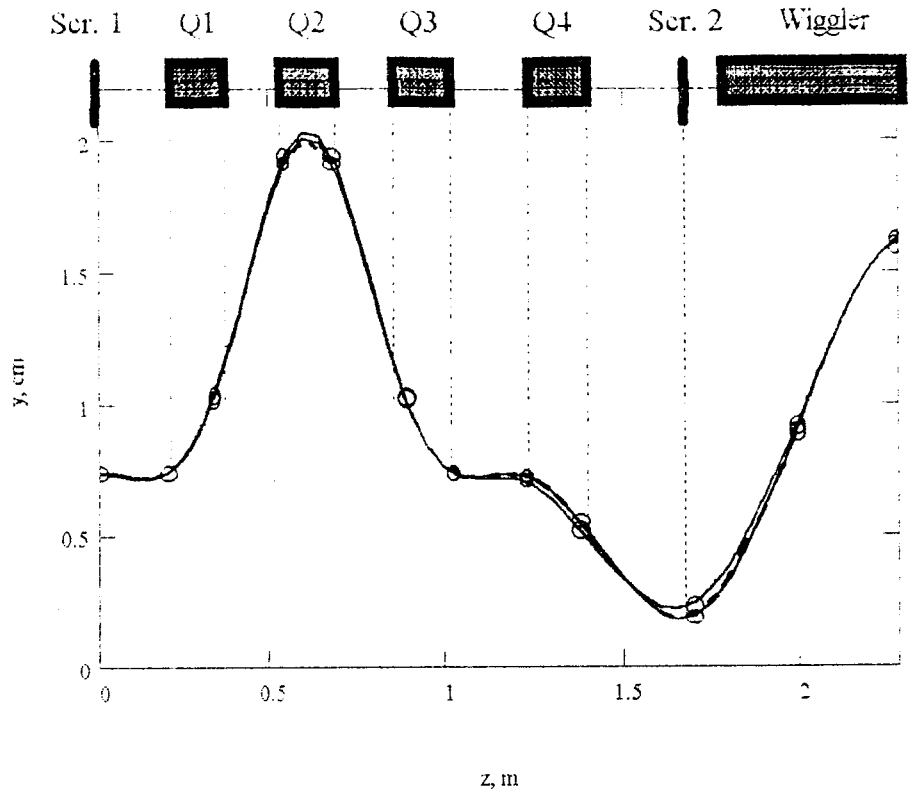

Fig. 2. Beam envelope in y-direction on the FEL quadruplet region. Continuos line - TRANSPORT, dashed line - ELOP.

CONCLUSION

The good agreement between the results of ELOP and TRANSPORT beam dynamics simulation codes for the FEL quadruplet before the wiggler in linear approximation takes place. It is possibilities to use both codes for TAU FEL beam dynamics problems: TRANSPORT - for optimizations using matrices method, ELOP - for modeling electrons moving using numerical methods of solving equations.