Beam Transport and Special Undulators Designed for High Power FELs, A.V. SMIRNOV, RRCKI - In designing of FELs with challenging output power requirements one of the most important problem is optimizing of e-beam transport. In particular, for high-average-power sectioned FEMs with beam recovering the problem is known as minimizing of the e-beam losses. The approach proposed here for multisection undulator designs contains the following main parts: i) optimum focusing strengths option and e.b. matching dependent from e.b. perveance on the basis of generalized K-V equations; ii) 2.5D transport simulation with taking into account non-linear transverse space charge forces; iii) beam transport simulations in real undulators in terms of measured quasi-3D field data updated in the code. The approach is applied for real two-section FEM undulator. The mean feature of the approach is the feasibility for undulators with asymmetrical focusing, combined weak (both quadrupole and periodic sextupole) or strong (alternating) focusing as well as (micro)undulators based on redistribution of longitudinal magnetic field. Another feature is possibility to control phase detuning between e-beam and e.m. wave.