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**Self-assembled Nanoscale Domain Structures in Ferroelectrics: Formation and Evolution**[1] VLADIMIR SHUR, Ural State University, Ekaterinburg, FERROELECTRIC LABORATORY TEAM — The formation and propagation of self-assembled nanodomain structures have been experimentally studied in lithium niobate single crystals. It has been shown that the "discrete switching" through appearance of the quasi-regular patterns consisting of individual nanodomains is a result of decay of highly non-equilibrium domain state. We have demonstrated that the necessary and sufficient condition for such abnormal domain behavior is ineffective screening of depolarization fields, which is characterized by the ratio between bulk screening and switching rates. We have systematically studied this effect in three different experimental situations: (1) "super-fast" switching in external electric field, (2) spontaneous backswitching, (3) intensive pulse irradiation by UV laser. The obtained nanoscale structures were classified and explained within unified approach. The main laws of formation of oriented short arrays and growth of strictly oriented "super-long" nanoscale domain "rays" accompanied by discrete turning and branching have been revealed. The geometry of the domain patterns obtained by computer simulation demonstrates one to one coincidence with experimental images.

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