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**Parafermion excitations in superfluid of quasi-molecular chains formed by dipolar molecules or indirect excitons**[1] ANATOLY KUKLOV, CSI, CUNY, ALEXEI TSVELIK, BNL — We study a quantum phase transition in a system of dipoles confined in a stack of $N$ identical 1D lattices (tubes) polarized perpendicularly to the lattices. The dipoles may represent polar molecules or indirect excitons. The transition separates two phases; in one of them superfluidity takes place in each individual lattice, in the other (chain superfluid) the order parameter is the product of bosonic operators from all lattices. We argue that in the presence of finite inter-lattice tunneling the transition belongs to the universality class of the $q = N$ two-dimensional classical Potts model. For $N = 2, 3, 4$ the corresponding low energy field theory is the model of $Z_N$ parafermions perturbed by the thermal operator. Results of Monte Carlo simulations are consistent with these predictions. The detection schemes for the chain superfluid of dipolar molecules and indirect excitons are outlined.

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