E. Babaev: *Paired phases in U(1)xU(1) gauge theories*

I will discuss a class multicomponent gauge theories where complex fields are coupled by either a vector potential or/and current-current interactions. Such theories can have a regime where (in contrast to single-component superconductors and superfluids) the energetically cheapest topological excitation is not the lowest-topological-charge vortex. Instead the energetically cheapest topological excitations are bound state of simplest vortices. When such composite topological defects proliferate the system undergoes a phase transition into a superfluid state of paired bosons, or, in case of superconductors, into charge-4e superconducting state. The talk will overview works in context of superconductivity and cold atoms (in particular Nucl.Phys. B686, 397 (2004) 397, Nature 431, 666 (2004), Phys. Rev. B 82, 134511 (2010), Phys. Rev. Lett. 101, 255301 (2008), Phys. Rev. B 78, 144510 (2008)) .