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**Double symmetry breaking and 2D quantum phase diagram in spin-boson systems** PIERRE NATAF, Laboratoire Maeriaux et Phenomenes Quantiques, Universite Paris Diderot-Paris 7 et CNRS — When the collective coupling between a chain of spins (two-level systems) and a bosonic mode becomes comparable with the two-level transition frequency, superradiant quantum phase transitions for the cavity vacuum can occur, for instance within the Dicke model [1]. Here, the quantum ground state properties of two independent chains of pseudo-spins interacting with the same bosonic field are investigated [2]. Each chain is coupled to a different quadrature of the field, leading to two independent symmetry breakings for increasing values of the two spin-boson interaction constants. A 2D phase diagram is provided with 4 different phases that can be characterized by the complex bosonic coherence of the ground states and can be manipulated via non-abelian Berry effects. Possible realizations of such model in circuit QED are discussed, generalizing the previous proposals to implement the standard Dicke model [3,4].

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