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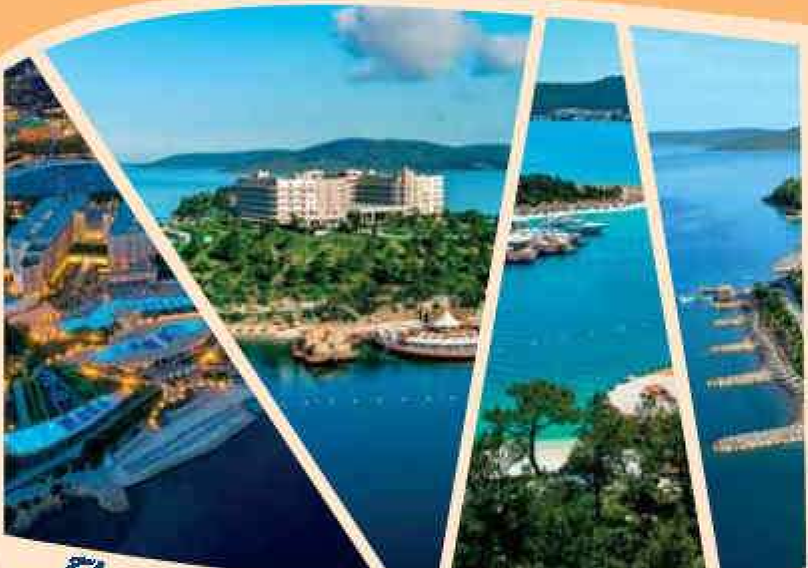

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MODELING THE F2/S2(N)/F1/S1 SUPERCONDUCTING TRIPLET SPIN-VALVE

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We study the critical temperature T_c of F2/S2(N)/F1/S1 structure (Si is a singlet superconductor, N is a normal metal, Fi is a ferromagnetic metal), where the long-range triplet superconducting component is generated at canted magnetizations of the F layers [1]. Previously it was demonstrated that transition temperature T_c in F2/F1/S [2] and F2/N/F1/S [3] structures (N is a normal metal) can be a non-monotonic function of the angle α between magnetizations of the two F layers, against the monotonic $T_c(\alpha)$ behavior obtained for the F2/S/F1 trilayers [4].

Matrix method was employed to calculate T_c as a function of the spin-valve parameters. We study the impact of an additional layer S2 on different spin-valve effect modes – the standard switching effect, the triplet spin-valve effect, the inverse switching effect – by variation of the interfaces transparencies, the exchange splitting energies, and the layers thicknesses. We examine the conditions under which superconductivity in an additional S2 layer is suppressed and it plays the role of a normal layer, and conditions under which the superconductivity is conserved and affects the superconducting T_c in the heterostructure.

The similar approach is utilized for modelling of the F2/N/F1/S1 heterostructure, where the ferromagnetic layers F1 and F2 can be made of different kinds of ferromagnets having different proximity parameters to the adjoining normal and superconducting layers. It is shown that at finite interface transparencies the layers thicknesses can be feasibly adjusted to provide all, standard, inverse and triplet regimes of superconductivity in the studied heterostructure.

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