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Photonic Surface-Bulk Waves in 1D All-Dielectric Metamaterials

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— It has been previously reported that it is impossible to satisfy the strong condition for the propagation of Dyakonov Surface Waves in 1D all-dielectric metamaterials. The strong condition requires that both evanescent and ordinary waves decay into the metamaterial. We show that the weak condition, when only ordinary waves decay, can be satisfied in 1D all-dielectric metamaterials, which gives rise to a new class of photonic resonances that combine evanescent extraordinary and non-evanescent ordinary waves in one excitation. By combining thin layers of such metamaterials with different dielectric and metal substrates one can excite resonances that are a hybrid between Fabry-Perot modes in the metamaterial layer and surface waves on the boundaries of this layer.

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