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Flat and bent branes in Born-Infeld-like scalar field models

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In this work, we explore a class of Born-Infeld-like scalar field models coupled with the standard 5-dimensional gravity scenario, supporting both flat and bent thick brane solutions. Our analysis encompasses scenarios where the 4-dimensional metric corresponds to Minkowski, de Sitter, or anti-de Sitter spacetimes. We introduce a comprehensive model, deriving the governing equations for the brane and establishing conditions for the development of a first-order formalism compatible with them. The compatibility of these equations with the model gives rise to specific constraints. To elucidate our methodology, we present various models that not only endorse localized warp factors but also have their characteristics influenced by the 4-dimensional cosmological constant. The solutions for the scalar field manifest as kink-like structures, drawing inspiration from models known as vacuumless. We consider a range of models that yield both symmetric and asymmetric solutions, displaying diverse behaviors for the warp factor, all obtained through analytical means. Notably, our analysis unveils a specific model showcasing a hybrid brane, characterized by a thick or thin profile depending on whether the extra dimension resides inside or outside a compact space.