Abstracts

Novel wave effects on anisotropic and ferrite planar slab waveguides in connection with singularity theory

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The characteristic interactions of discrete modes supported by planar isotropic and anisotropic dielectric and ferrite slab waveguides are analyzed using singularity and critical point theory, leading to a rigorous and complete explanation of all modal interactions. For an anisotropic planar waveguide having an arbitrarily-orientated optical axis, it is shown that mode coupling is controlled by the presence of an isolated Morse critical point accompanied by a pair of complex-conjugate frequency-plane branch points. The interaction of space-wave leaky modes on a grounded anisotropic slab is studied by investigating the evolution of complex frequency-plane branch point singularities as the orientation of the optical axis varies. Space-wave leaky modes of a biased grounded ferrite slab waveguide are studied in connection with different types of branch-point singularities, resulting in the observation of novel wave effects on ferrite slabs. The general theory is presented, and numerical results are provided for some specific waveguides.

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