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Study of Superconducting Patch Printed on Electric-Magnetic Substrates Materials

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Abstract : In this paper, the effects of both uniaxial anisotropy in the substrate and high Tc superconducting patch on the resonant frequency, half-power bandwidth, and radiation patterns are investigated using an electric field integral equation and the spectral domain Green's function. The analysis has been based on a full electromagnetic wave model with London's equations and the Gorter-Casimir two-fluid model has been improved to investigate the resonant and radiation characteristics of high Tc superconducting rectangular microstrip patch in the case where the patch is printed on electric-magnetic uniaxially anisotropic substrate materials. The stationary phase technique has been used for computing the radiation electric field. The obtained results demonstrate a considerable improvement in the half-power bandwidth, of the rectangular microstrip patch, by using a superconductor patch instead of a perfect conductor one. Further results show that high Tc superconducting rectangular microstrip patch on the uniaxial substrate with properly selected electric and magnetic anisotropy ratios is more advantageous than the one on the isotropic substrate by exhibiting wider bandwidth and radiation characteristic. This behavior agrees with that discovered experimentally for superconducting patches on isotropic substrates. The calculated results have been compared with measured one available in the literature and excellent agreement has been found.

Keywords : high Tc superconducting microstrip patch, electric-magnetic anisotropic substrate, Galerkin method, surface complex impedance with boundary conditions, radiation patterns
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