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ABSTRACT

# Design, implementation and evaluation of VIS and NIR tunable photonic filters

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We propose the implementation of optical filters built from one-dimensional photonic crystals (1D PCs) to be used in optical networks based on wavelength division multiplexing (WDM). These filters route and switch optical signals at a certain wavelength in the visible or near infrared spectral regions, following the optical telecommunication channels currently in place. The proposed photonic heterostructures comprise the integration of ferroelectric ($BaTiO_3$), dielectric ($Y_2O_3$) and superconducting materials ($YBa_2Cu_3O_7$); our analysis is validated both theoretically and experimentally above and below critical superconductor temperature. Our findings contribute to the implementation of optical filters based on photonic crystals that can be integrated into photonic and optoelectronic circuits, or in devices for the transmission of information in the visible and near infrared range in very low temperature environments (e.g., outer space). In a previous work [1], we have succeeded at experimentally realising ferroelectric/superconductor 1D photonic crystals as suitable engineered nanosystems for tuning and controlling electromagnetic wave propagation in a wide region of the visible spectrum. Here, we present a novel photonic heterostructure composed of N alternating layers of dielectric/ferroelectric materials and a superconductor defect layer at its center, the latter fabricated by DC and RF sputtering onto polished SrTiO3 (001) substrates. Our work covers a wide range of realistic fabrication parameters for tuning the optical response of the single-channel photonic filter such as thickness, temperature, number of periods N, and direction of incident radiation.

## REFERENCES

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