

## Analytical vernier effect of a PANDA ring resonator for microforce sensing application

### Abstract

A nonsymmetric Vernier type of a modified add-drop filter known as a PANDA ring resonator is simulated and calculated to achieve wider free spectral range (FSR) in the order of magnitude of terahertz and micrometer with different ring radii. The expanded FSR is determined by the least common multiple of the FSRs of the individual ring resonators. The dependence of the transmission characteristics of the PANDA ring on the coupling coefficients of directional couplers is studied. The improvement in suppression of interstitial resonances by using high-order Vernier filters is investigated. In application, such a system can be employed as a sensing system for measuring the wavelength shift, where the low power consumption due to the low intensity source is the other advantage. The potential for microscale force sensing application, especially, for atom/molecule force sensors. The sensing unit structure can be in the few hundred micrometers to millimeters. The applied force can be in the form of distributed force within thin film material which is coated on the sensing unit.