



Fig. 5. (a) Original spectrum of the device, with through (red) and drop (blue) ports presenting the doubled FSR. (b) Spectrum after changing the effective index of the cavity coupled to the drop port. No resonances are observed. (c) New resonance of the filter after non-blocking tuning.

function (Fig. 5b), as expected. In Fig. 5c we show the final step of the tuning, where a new central resonance wavelength, at 1603.1 nm, is observed under 115 mW of heat power applied for all heaters. The thermal response of the heaters was measured to be in the order of 10 μ s. Non-blocking operation is clear from the experimental results, confirming that a doubled FSR filter can be reconfigured from a wavelength to another with negligible insertion loss for intermediate wavelengths.

4. Conclusion

We fabricate and characterize a CMOS-compatible, Mach-Zehnder-coupled, second-order-microring-resonator filter with doubled free spectral range and demonstrate non-blocking thermo-optical filter reconfiguration. We demonstrate that non-blocking tuning can be achieved for a doubled FSR filter, which translates to a higher throughput for NoC's. It is important to note that in the current configuration, when the device is reconfigured and the refractive index of part of the structure is modified to achieve the all-pass filter, an overcoupled resonance is obtained, which still has a small power penalty and imparts some loss (< 1 dB) on other channels allocated between the initial and final wavelength. Even though the procedure described does not block the communication of other channels, its power penalty must be considered in the network design, and may limit the number of channels that can be reconfigured simultaneously.

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