

Ultra-compact DWDM Filter Tunable Across the C-band

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Abstract

We demonstrate a third-order cascaded microring filter with 2.5 μm -radius resonators, showing a flat-top response and a 35-nm free spectral range. Continuous wavelength tuning over the C-band has been achieved.

Motivation

Design an add-drop filter which exhibits:

- Flat-top response, sharp roll-off and large bandwidth;
- Small footprint;
- Large free spectral range (FSR);
- Tunability across a large wavelength range;
- Insensitivity to fabrication non-uniformities.

Filter Design

- Third-order cascaded microring filter with rings of radius 2.5 μm .
- Gaps were chosen in order to target a maximally flat (Butterworth) filter shape.

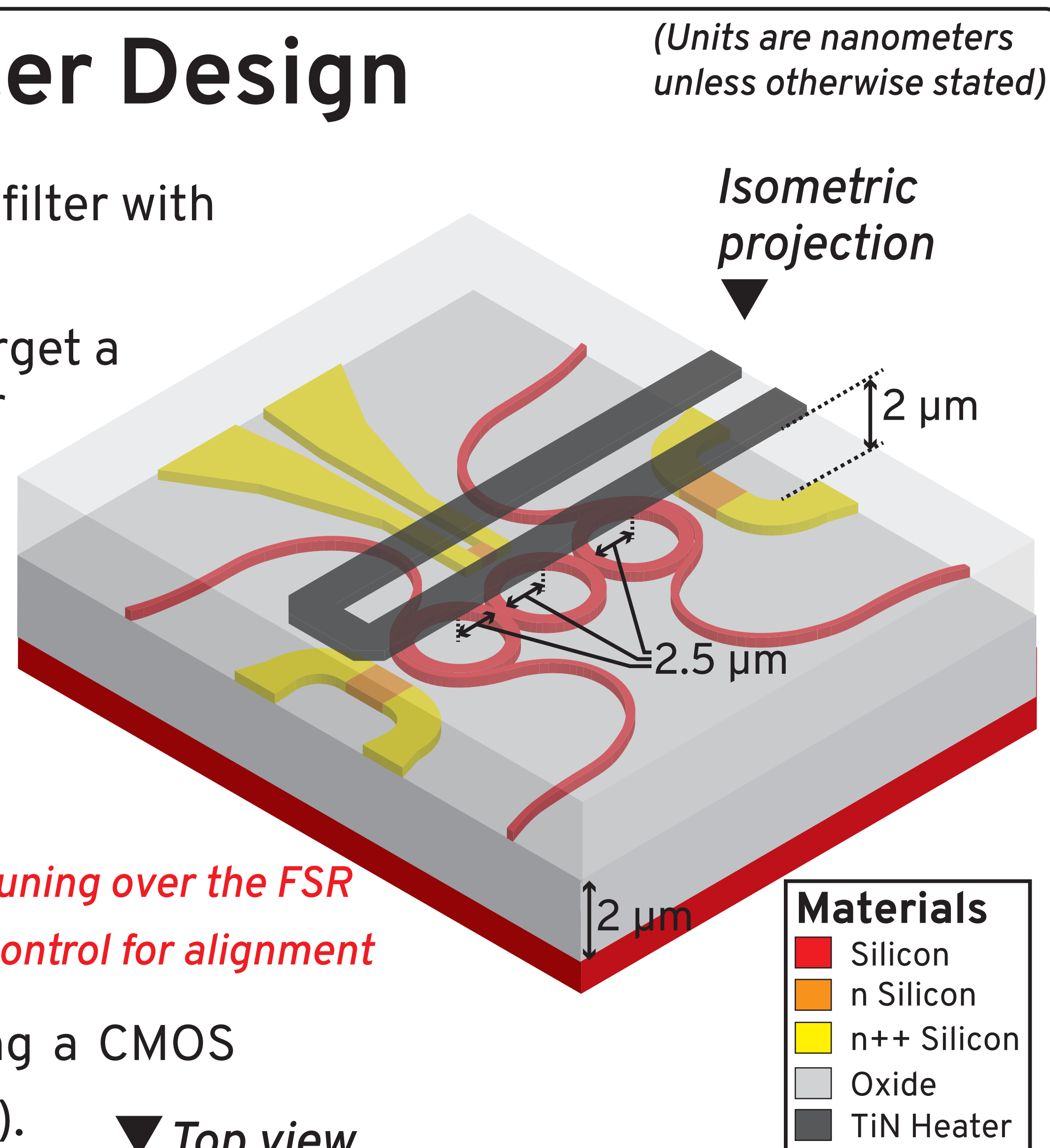
- Small footprint

Passive \rightarrow 15 x 5 μm^2
Active \rightarrow 25 x 25 μm^2

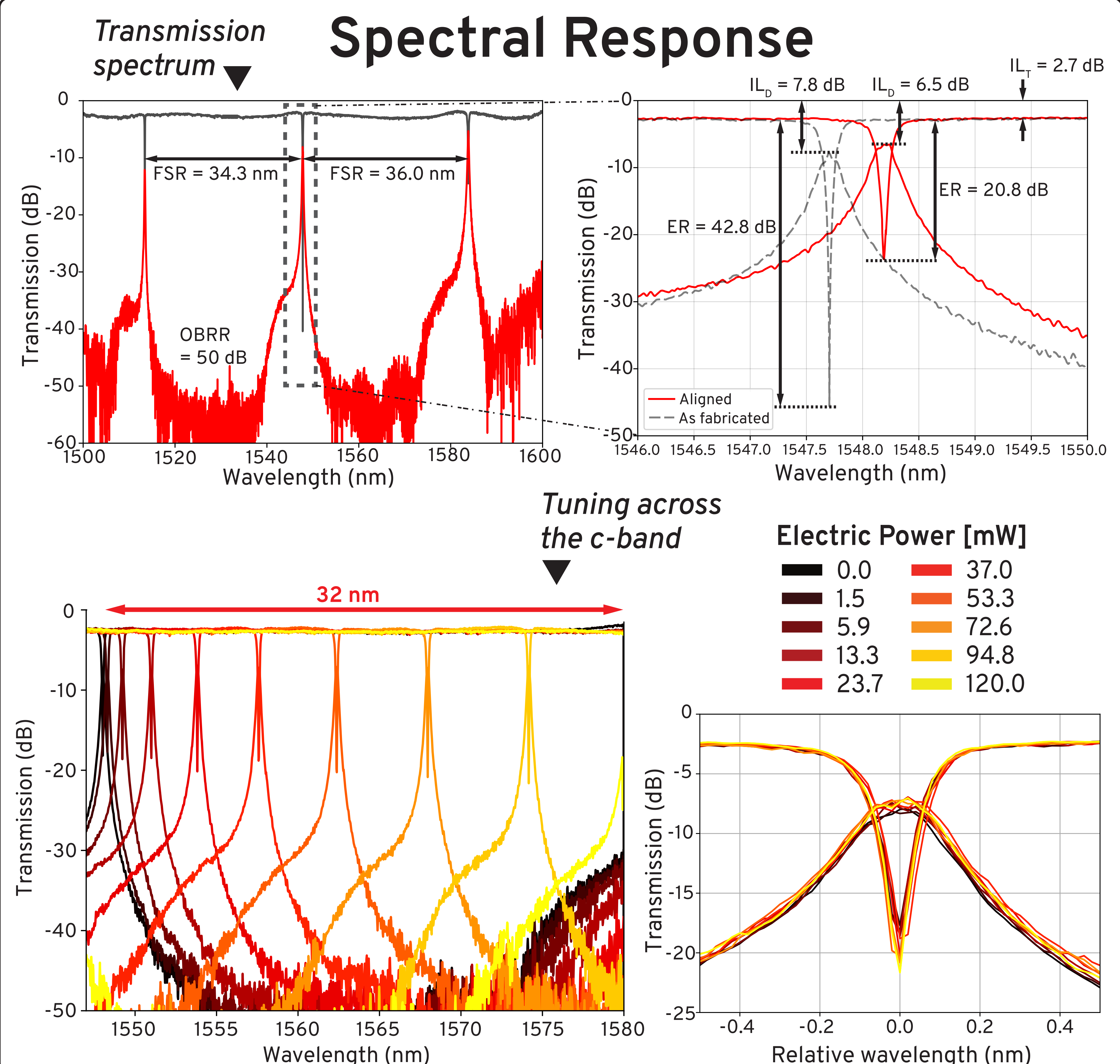
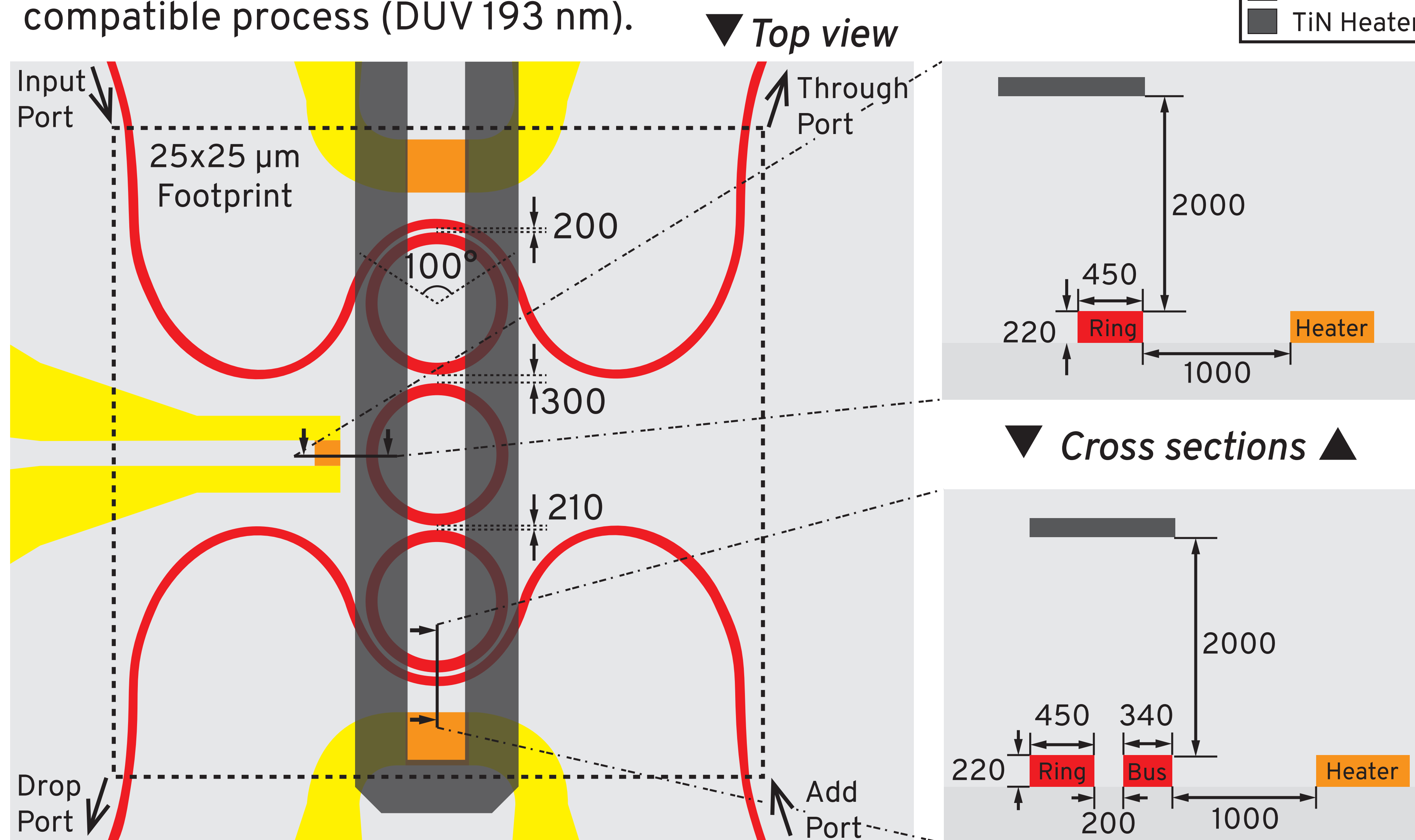
- 2 Tuning mechanisms

Metal Heater \rightarrow Coarse control for tuning over the FSR
Semiconductor heaters \rightarrow Precise control for alignment

- Fabricated at A*STAR IME using a CMOS compatible process (DUV 193 nm).



Materials	
■	Silicon
■	n Silicon
■	n++ Silicon
■	Oxide
■	TiN Heater



Conclusion

We demonstrated a novel third-order cascaded microring filter made of ultra-small rings with a radius of 2.5 μm . The filter can be continuously tuned over 32 nm with a power consumption of 120 mW. With an ultra-compact footprint of 25 \times 25 μm^2 and low complexity, this device paves the way for integration in photonic systems on a chip. It may find applications in flexible DWDM multiplexing and wavelength routing.

Acknowledgement

The authors would like to thank CMC Microsystems for providing access to design tools and MPW service. We also thank the SiEPIC program for the training. This project is supported by the Natural Sciences and Engineering Research Council of Canada (NSERC).

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