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#### 4. Conclusions

An injection voltage dependent study of Er<sup>3+</sup> doped slot waveguides have been performed to quantify the injected carrier induced losses. The Er<sup>3+</sup> electroluminescence has been characterized at 1.53  $\mu$ m for two different active materials (Er<sup>3+</sup> doped SiO<sub>2</sub> or Si-rich oxide) in the slot region of the waveguides. In time-resolved experiments, we obtain a sharp EL peak when the voltage is switched off due to the different lifetimes of excited Er<sup>3+</sup> ions and of the generated carriers. An electrical pump & probe measurement has allowed us to determine the injected carrier losses in 1 mm long waveguides, obtaining an extinction ratio in d.c. modulation of 6 dB with an operation power consumption of 120  $\mu$ W and a spectral bandwidth  $> 25$  nm. Further improvements in terms of power consumption can be considered if the top electrode, the active slot layer and the doping distribution are optimized.

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