Membrane-type DBR-microlasers for the integration of electronic and photonic ICs

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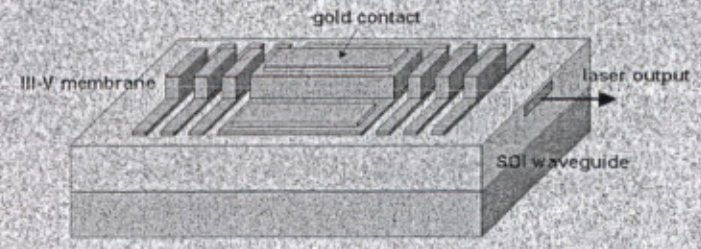
For future electronic integrated circuits, a severe bottleneck is expected on the global interconnect level. An optical link that consists of a laser source, an optical waveguide and a detector, integrated with the microelectronic circuit, can prove to be a solution. A promising approach for a compact optical link is the use of a Silicon-on-Insulator (SOI) waveguiding layer in combination with III-V microlaser sources and microdetectors, which are defined in a III-V membrane layer bonded on top of the SOI-stack [1].

In this paper, we focus on the design of electrically pumped membrane-type DBR-microlasers that couple evanescently to a passive SOI-waveguide. We have performed a two-dimensional eigenmode expansion analysis of these DBR-microlasers, including metal contact absorption losses, semiconductor absorption losses and diffraction losses. The results show that an optimized, 25um-long device in a 1um-thick membrane supports laser modes with a threshold material gain level comparable to gain levels for long-wavelength VCSELs [2], i.e. around 1000/cm for 4 quantum wells. For these devices, almost 30% of the total cavity losses are coupled to the SOI-waveguide. The fabrication scheme of the device is compatible with current state-of-the-art processes.



[1] C. Monat et al., *Electron. Lett.*, **37**, pp. 764-765 (2004).
[2] I. B. Dubravko et al., *IEEE J. Quant. Electron.*, **37**, pp. 764-765 (2004).

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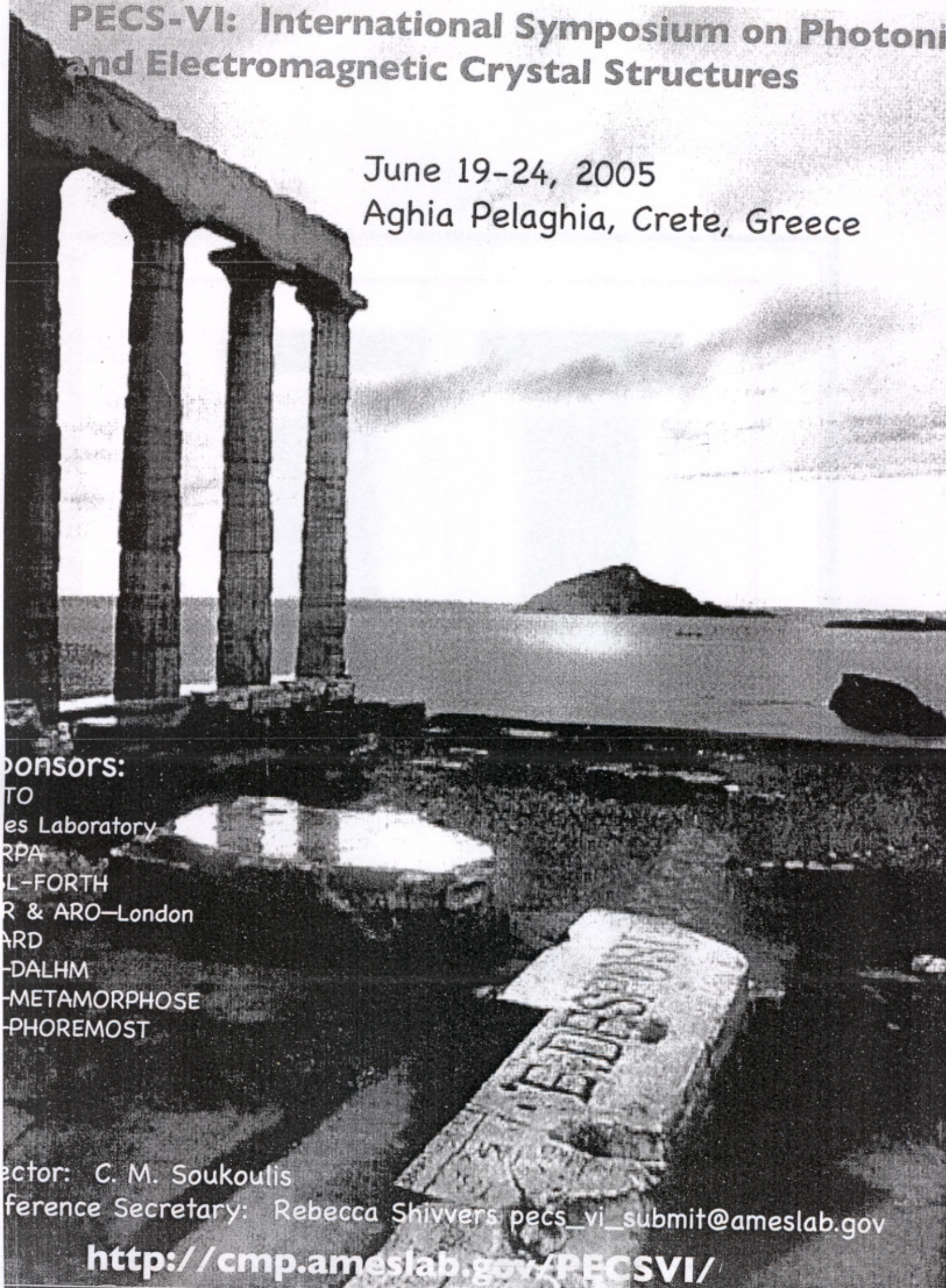

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