

Descriptive title for the student project

Professor:	Name	Office	e-mail	
Scientific Assistant Contacts:	Name	Office	e-mail	
Project Type:	Master Thesis/Semester Project		Section:	Microengineering
Official Start Date:	TBD			
Submission of Final Report:	TBD			
Presentations at Group Meeting:	TBD			

Context: Integrated Silicon Photonics is today an effervescent field enabling the construction of increasingly complex optical circuits on a chip. Exploiting the well-mastered CMOS fabrication technologies, Si Photonics can provide solutions for a wide variety of applications that require light production, processing or sensing. Through the addition of MEMS, such circuits can be doted of means of being reconfigured (analogously to FPGA in electronics) or of fine tuning their properties to compensate for fabrication imperfections.

Project overview: At Q-lab there are ongoing projects in which suspended Polysilicon MEMS, actuated electrostatically, are being incorporated into the photonic platform. Some of these MEMS are digital switches that do not require a constant voltage to keep them in the ON or OFF state. The latching is given by the bistability of buckling of elements. The fabrication of these latching MEMS switches is a long process, comprising 6 to 8 photolithography masks and a wide variety of etching and deposition methods or different materials.



Figure 1. Left p: Loren ipsum [1]. Center: Loren Ipsum. Right: Loren Ipsum [2].

What the student will do. The student will take part in the cleanroom microfabrication work, by operating and analyzing the result of some of the many subsequences of steps that need to be optimized in this complex process flow, subject to the needs of the project as it advances:

- DUV stepper photo-lithography (the newest machine at the CMi): Resolution tests, Processing (BARC removal, stripping)
- Plasma etching procedures for Si etching (optical layer) and oxide patterning: Depth control, Wall smoothness.
- Oxide deposition on Si with topography and planarization: Deposition temperature, Void formation, Achieved

All these studies will rely on quantitative and qualitative metrological studies in the cleanroom (SEM, AFM, optical microscopy, profilometer, etc). The drawing of lithography layouts may be necessary to perform some of the tasks.

Student gain. Through this project, the student will gain a vast hands-on experience in microfabrication main techniques such as photolithography, thin film deposition, and etching, and apply them in the hot topic of integrated Si photonic MEMS.

NOTES: All that is red has to be removed. All that is yellow requires your choice and the yellow highlight must be removed. The grey text is an example and should be black in the end. **This description has to fit in one page.**

[1] PK Day et al. (2003) Nature 425 817.

[2] OG Vendik IB Vendik DI Kaparkov (1998) IEEE Transactions on Microwave Theory and Techniques, 46(5) 469.