

# Si /III-V Nanofils

PhD student: Daria Beznasiuk

Supervisor: Moira Hocevar

## I. Description of the PhD thesis

III-V/Si semiconductor heterostructure nanowires (NWs) are a promising strategy to integrate light emitters on Si. Indeed, due to the strain accommodation by the free lateral side of NWs related to the presence of facet edges and side walls, the formation of misfit dislocations can be minimized. III-V and Si can be combined in axial heterostructure nanowires with diameters below 100 nm, even with lattice mismatch of 4%.

The objective of my PhD thesis is to combine direct band gap III-V materials with Si by NW-geometry on Si substrates in order to create the single photon emitters and detectors at telecommunication wavelengths.

## II. Project for PTA

Arrays of Si NWs on Si substrates will be realized by reactive-ion etching (RIE) in the clean-room of PTA. First, Si substrates will be prepared in the chemical lab of NPSC at C5: gold colloids will be deposited on HF cleaned Si wafers. The gold colloids are used as mask in order to prevent the etch of Si underneath (see Fig 1). The types and amount of gas used in RIE vary depending upon the etch process; in our case, sulfur hexafluoride ( $\text{SF}_6$ ) will be used for anisotropic etching of Si substrates. The time, substrate temperature and rate of the process will be chosen based on the required height of Si NWs. The final structure is schematically represented on the Figure 2.

