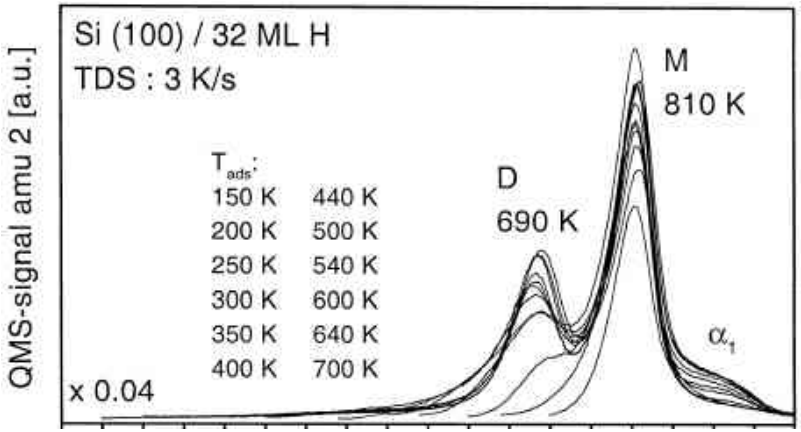
Investigation of the effect of H chemisorption states on abstraction reactions on Si(100)

R. Bisson
EPFL-LCPM
Lausanne-Suisse

M. Châtelet – L. Philippe
Ecole Polytechnique - PICM
Palaiseau

T. Angot – C. Thomas
Université Provence - PIIM
Marseille



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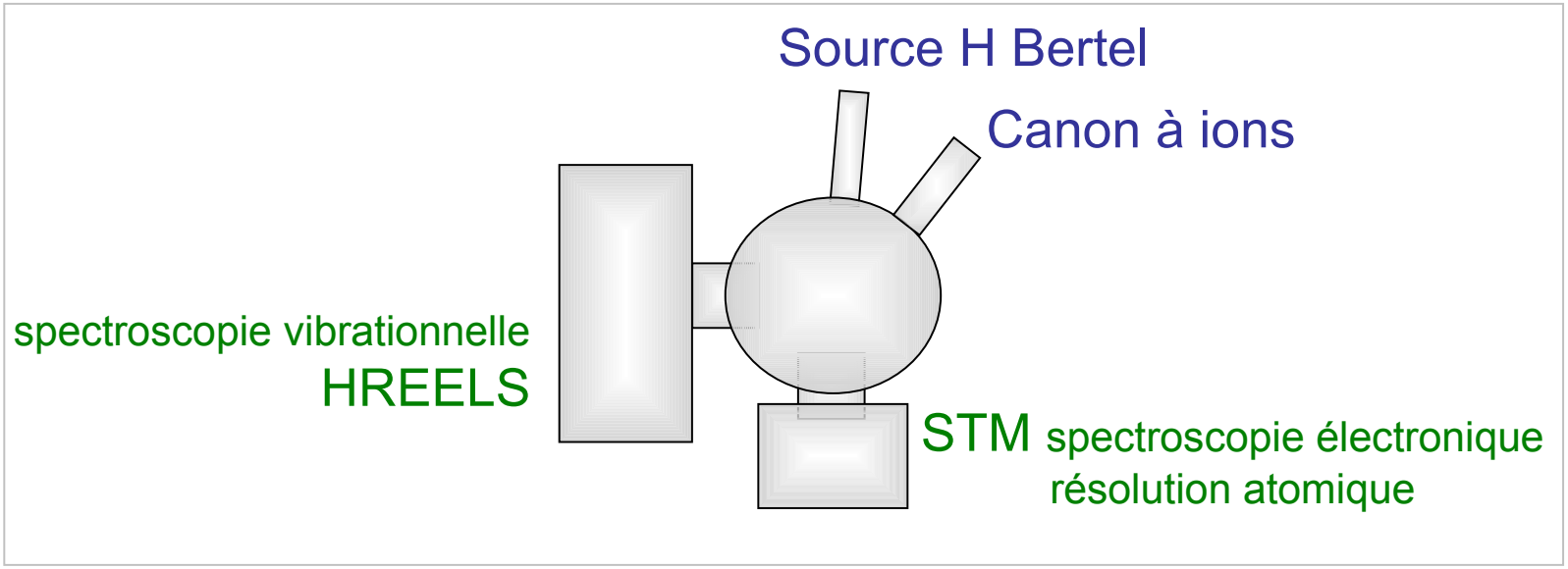
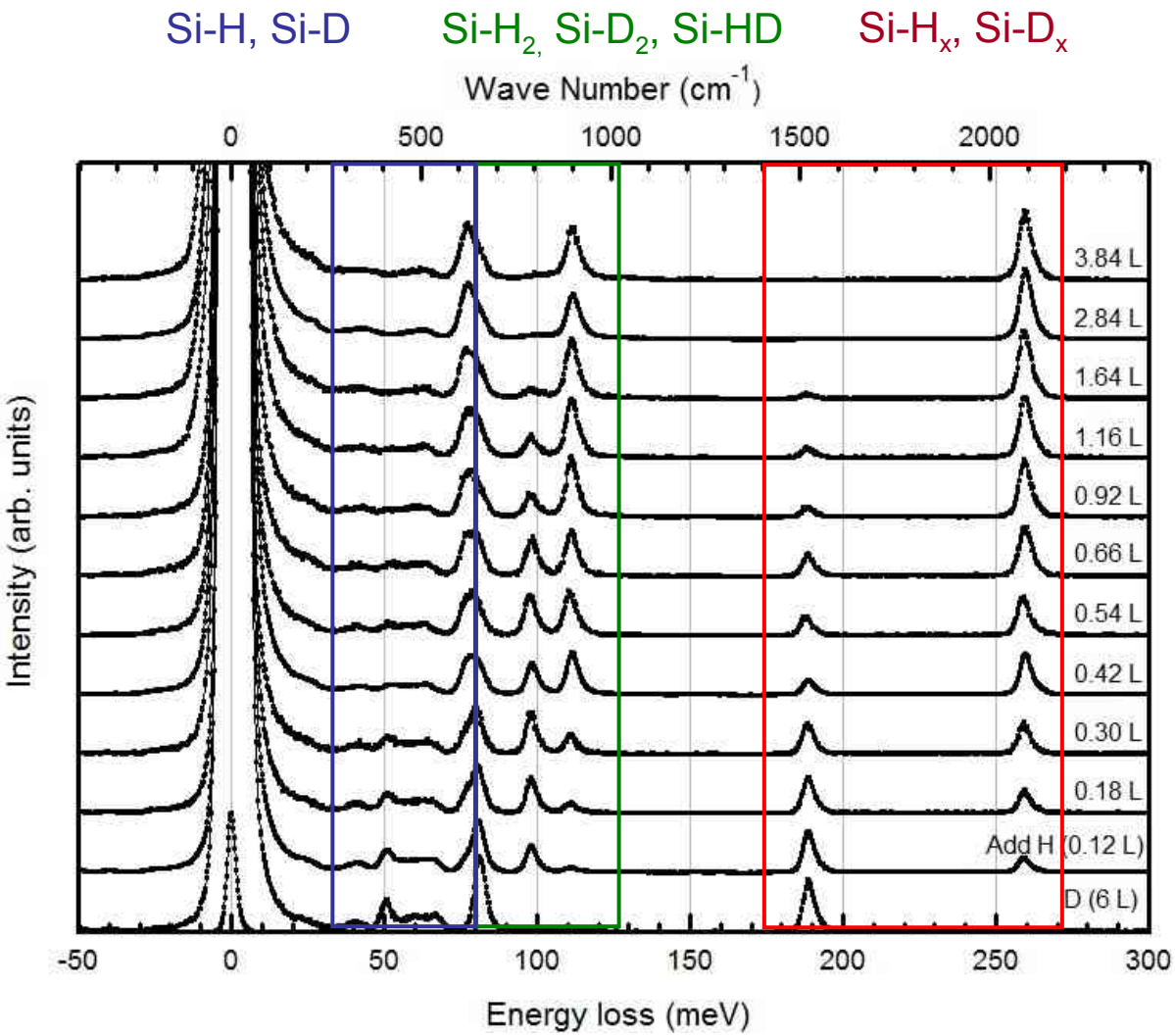
Experiments at the Plasma-Surface group in PIIM



Investigation of the effect of H chemisorption states on abstraction reactions on Si(100)
mono-hydride vs. di-hydride

Isotope replacement H + D-Si(100)-3x1 → H-Si(100)-3x1 probe by HREELS



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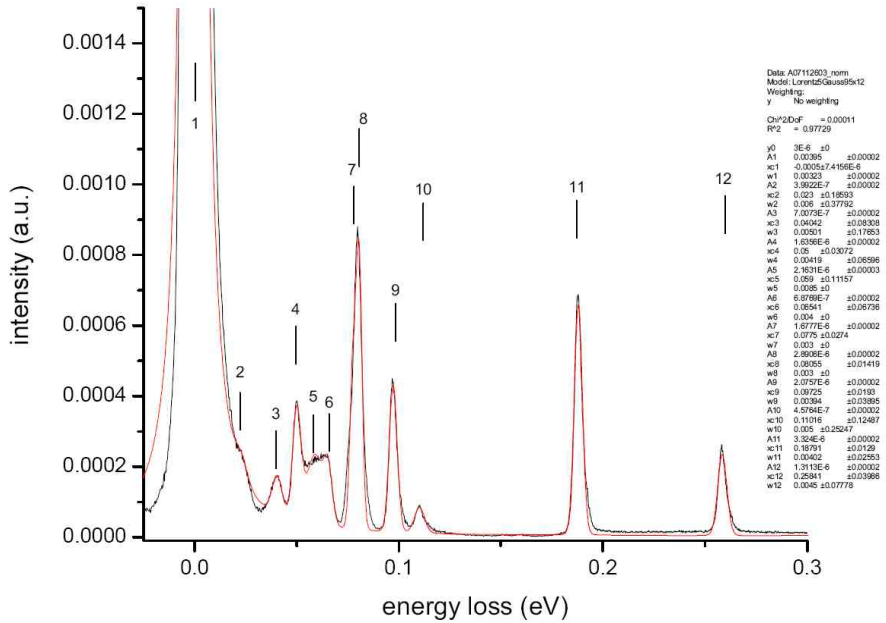
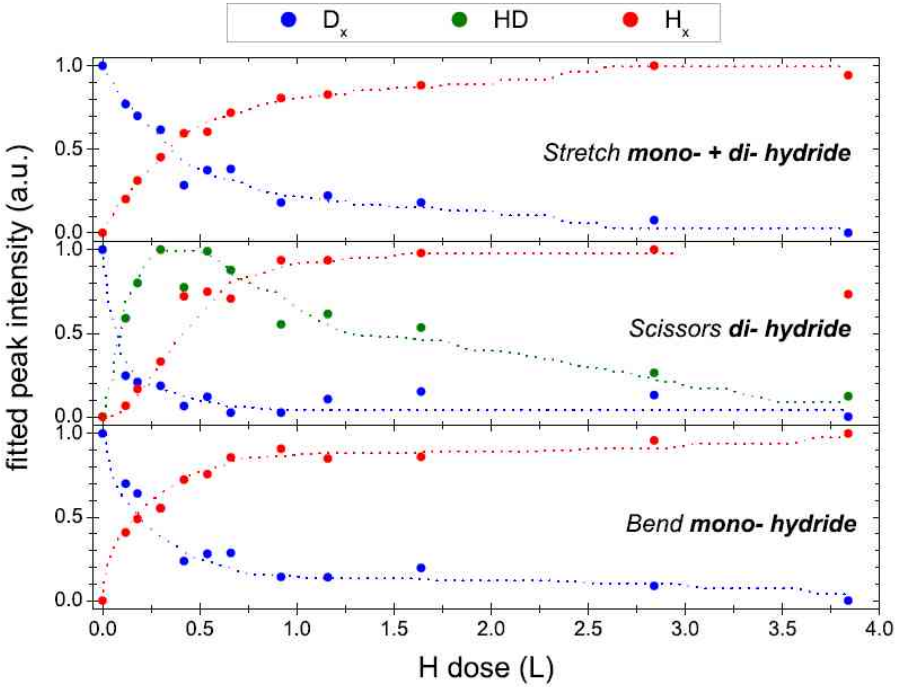
mono-hydride vs. di-hydride





- Need additional data points at lowest doses
- Need to model the isotope replacement with a kinetic model
- Need to investigate the inverse isotope replacement (isotope effect)

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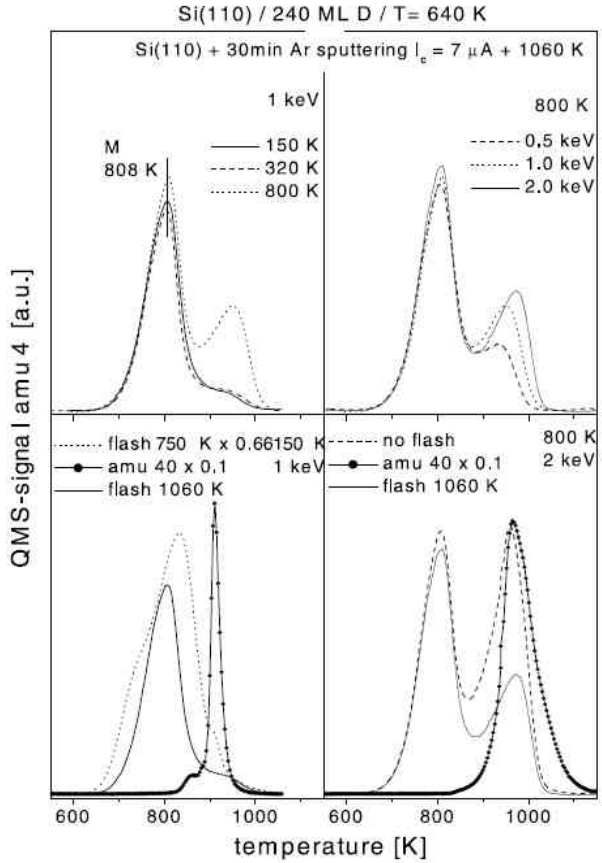

Fig. 3. Desorption spectra measured after admitting 240 ML D atoms to Si(1 1 0) surfaces at 640 K. The Si surfaces were prepared prior to D admission in the following way. Top left: 1 keV Ar sputtering at indicated T, annealing at 1060 K. Top right: x keV Ar sputtering at 800 K, annealing at 1060 K. Bottom left: 1 keV Ar sputtering at 150 K, flash to 750 K. The dotted line represents the deuterium desorption spectrum recorded up to 1060 K, the simultaneously recorded Ar spectrum is shown by filled circles. Subsequently the sample was exposed to D again and the deuterium desorption spectrum shown by the full line was measured. Bottom right: 2 keV Ar sputtering at 800 K, no subsequent flash. The deuterium spectrum recorded up to 1060 K is shown as a dashed line, the Ar spectrum as filled circles. Subsequently the sample was exposed to D again and the full line deuterium desorption spectrum was recorded.

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Finding a spectroscopic signature for the *α* subsurface state

- a feature at ~115meV has been observed
- which does not relate to OH impurities
- should not relate to SiO impurities
- observed in litterature but never assigned

- Additional data to exclude any kind of impurities
- Supplementary technique to correlate the appearance of the ~115meV feature with the population of the *α* state without any doubt… TPD!

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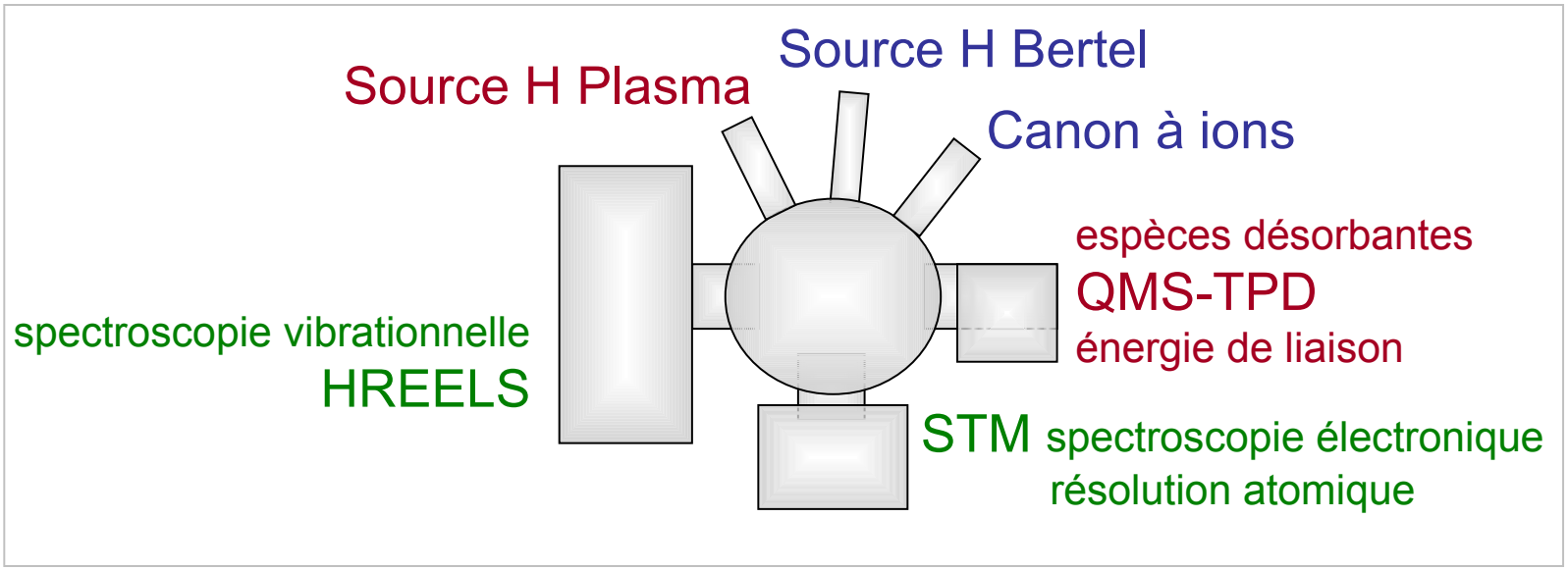
To be continued…



- Complete the data already obtained for mono- vs. di- hydride
- Confirme the feature attributed to *α*-H

- Investigate the effect of incident energy of H (Kuppers vs. Namiki)