



# The LASEC Activities

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## Laboratorio di Spettroscopie Elettroniche e di Correlazione (LASEC) Electronic and Correlation Spectroscopy LAb.

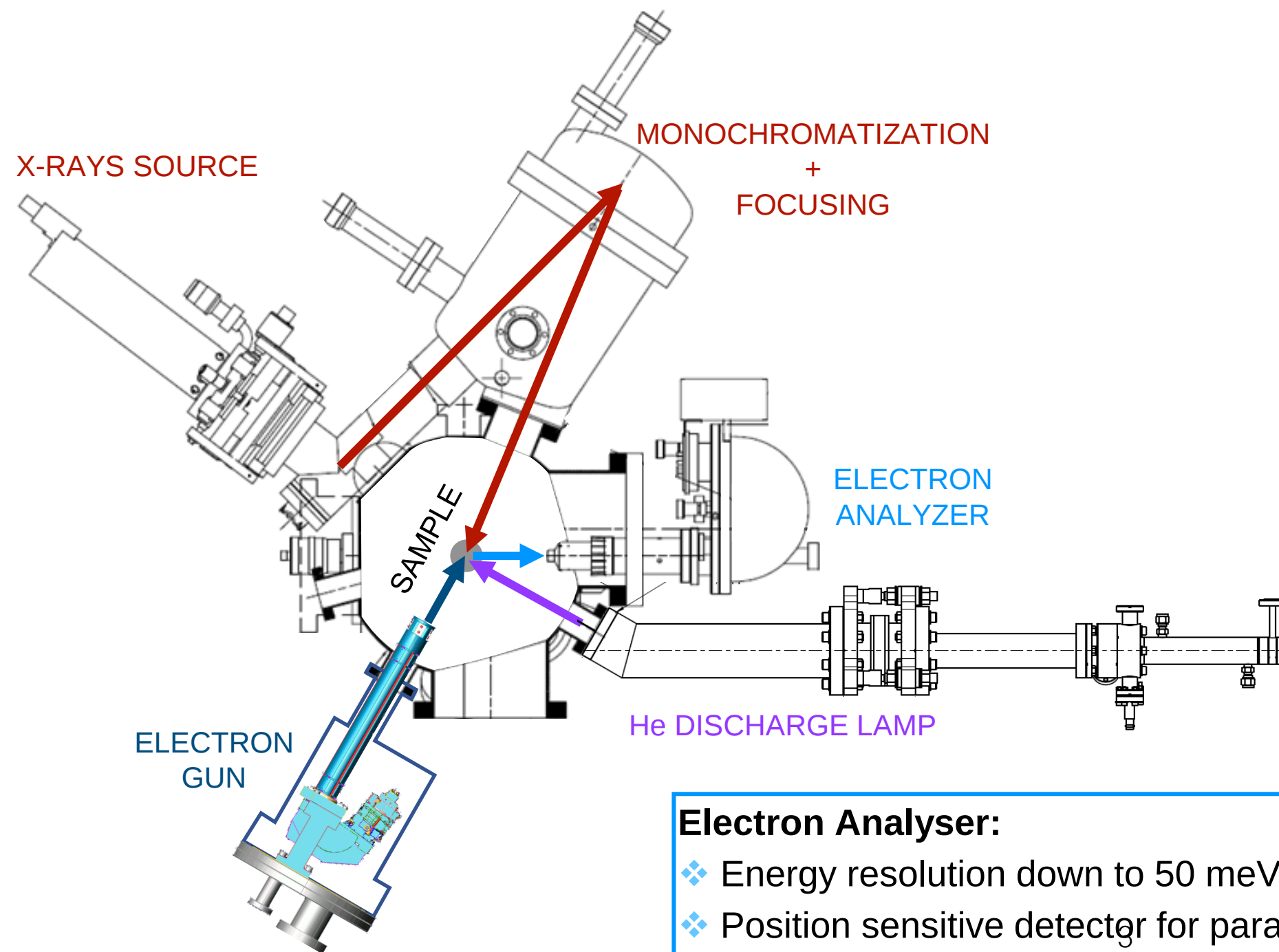
### Short story of LASEC

- ☐ The LASEC lab has been active in the physics of surfaces and interfaces since the origins of ROMA TRE (1995)
- ☐ Founded by G. Stefani and A. Ruocco
- ☐ Investigation of surface and interfaces at sub-nanoscale
- ☐ Extensive use of electron spectroscopy (XPS, UPS, EELS)
- ☐ Investigation of electron correlation by Coincidence spectroscopy (e,2e) and ( $\gamma$ ,2e)
- ☐ Determination of the surface structure of metal semiconductor and interfaces

### LASEC nowadays

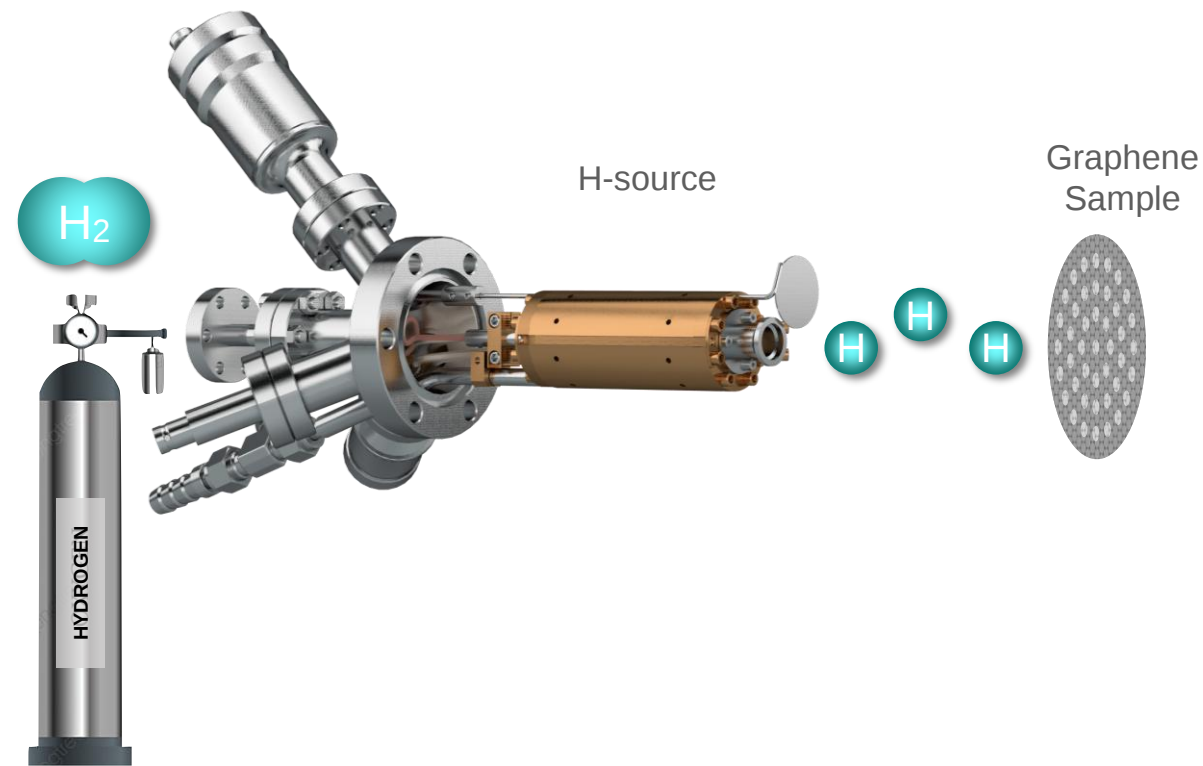
- ☐ extensive experience in the study of carbon-based nanostructures
- ☐ Transmission of electron through single and multi-layer graphene
- ☐ Hydrogenation of carbon-based nanostructures
- ☐ Electronic structure of organic molecule-metal interface

# The LASEC Experimental Chamber

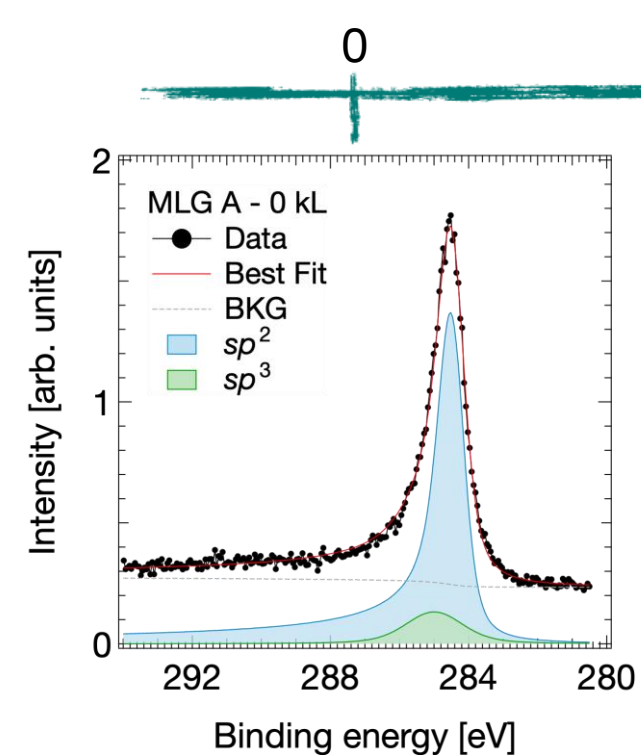
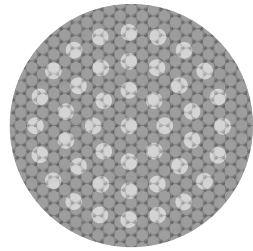




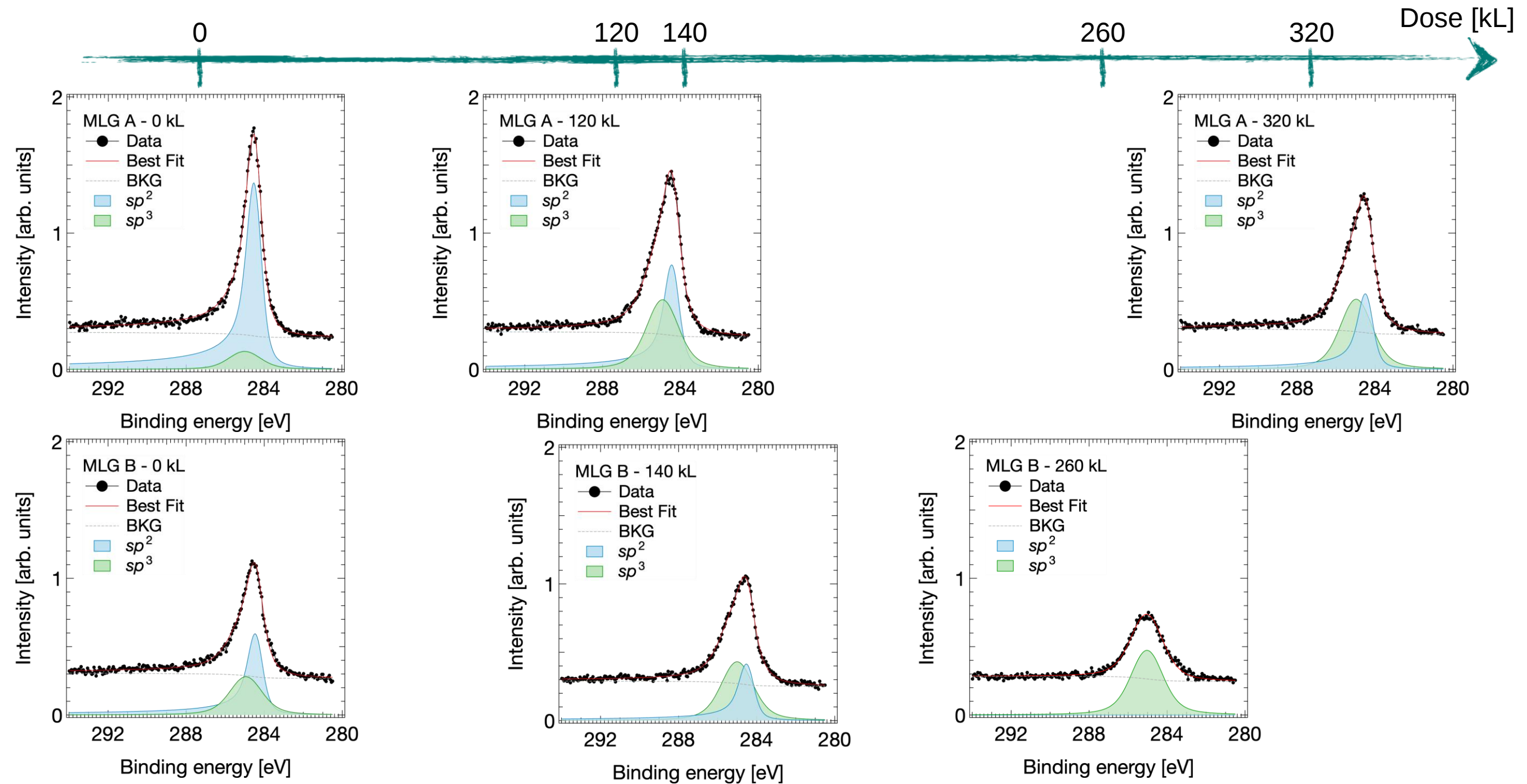
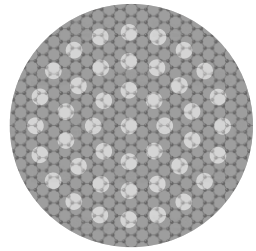
# Hydrogenation of Graphene on TEM



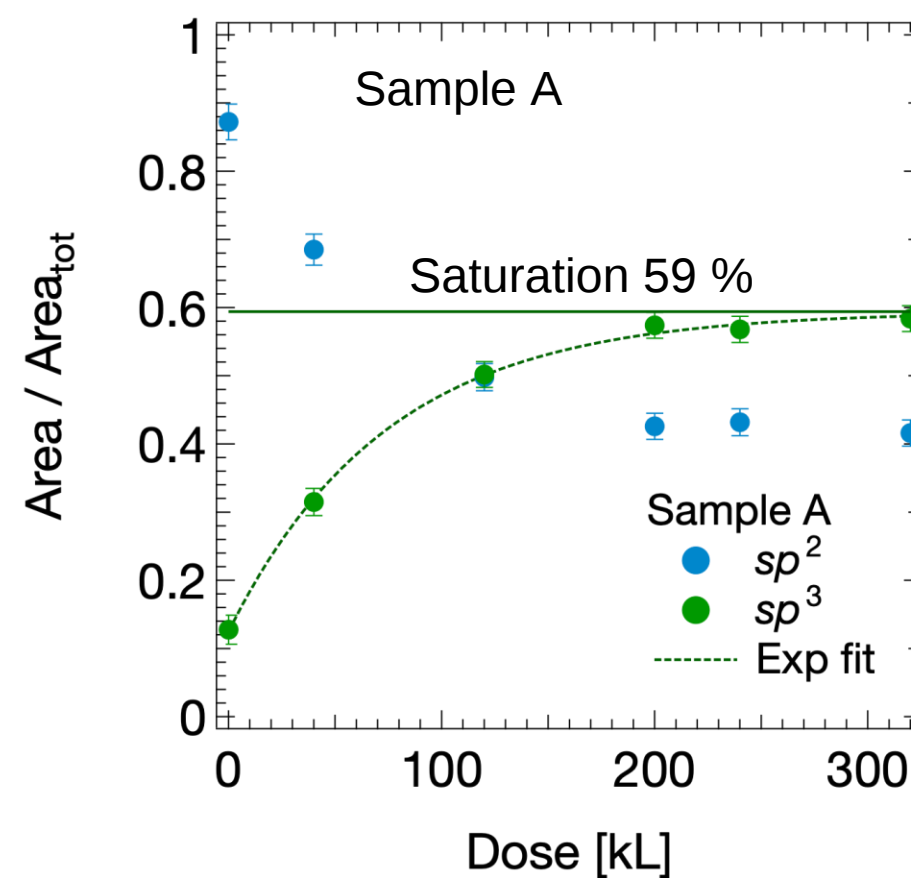
# Two Graphene on TEM Samples From Same Growth



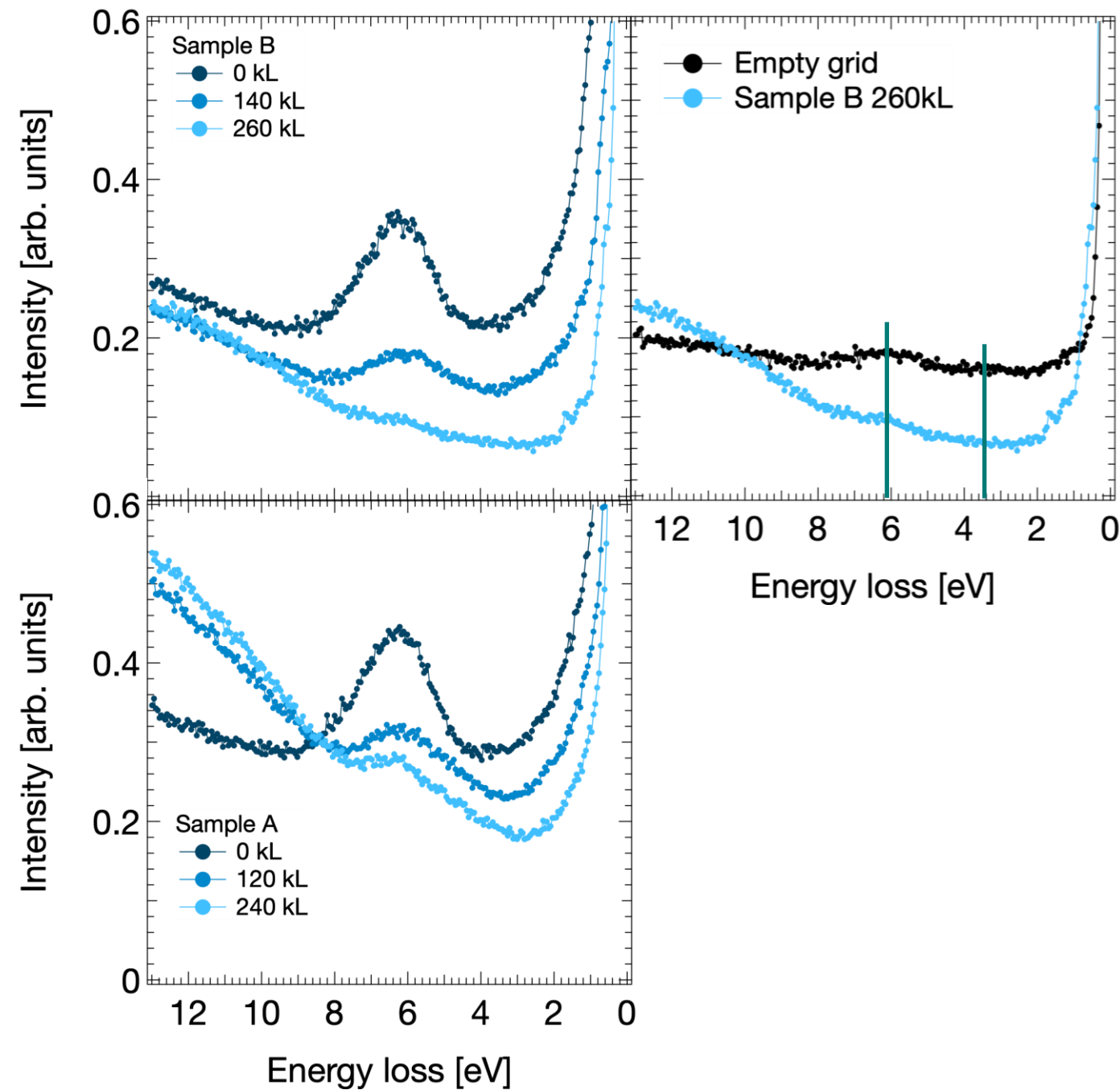
# Different Starting Point, Different Saturation Point



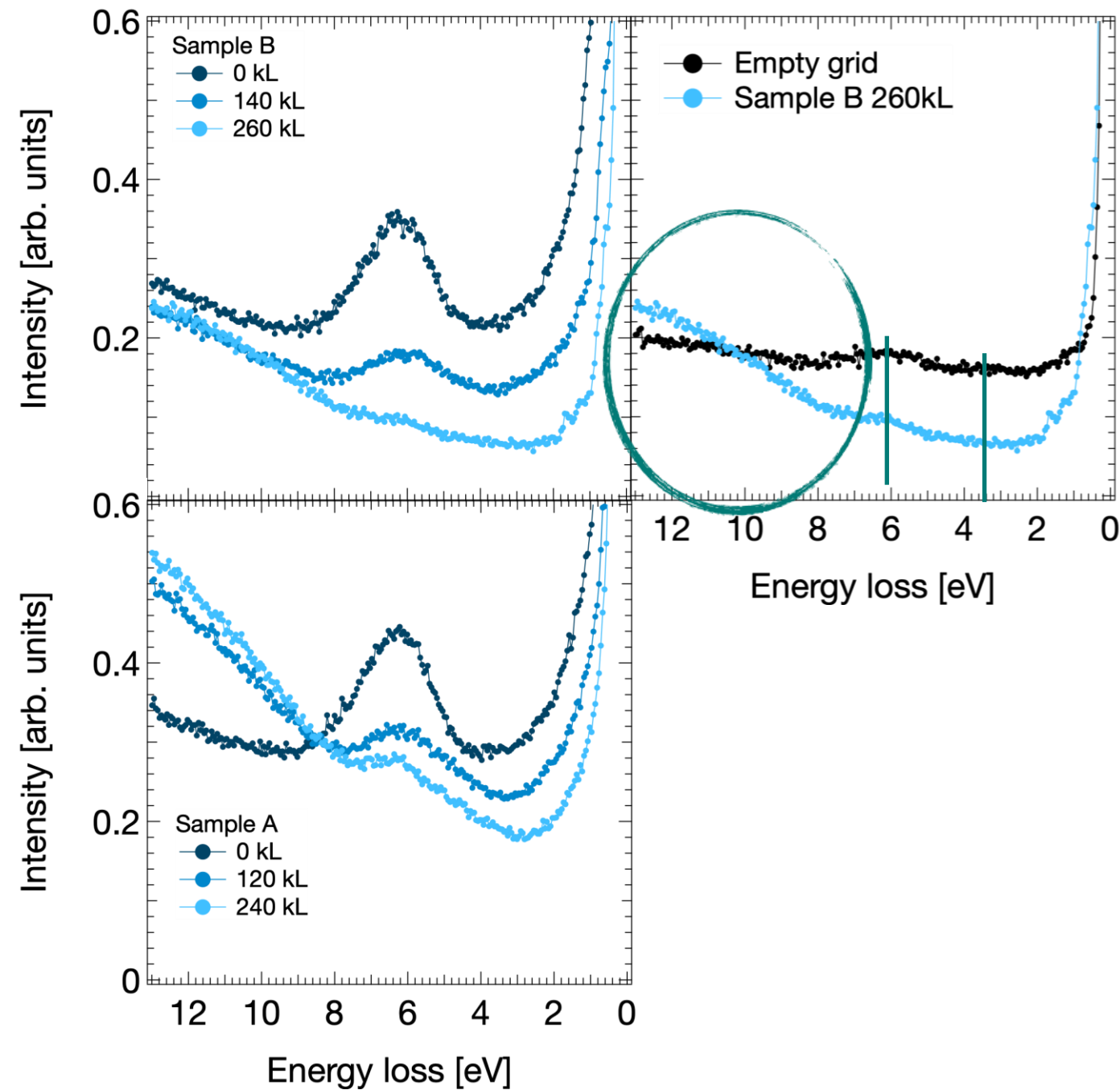
# The More Is $sp^3$ , the Higher Will Be H-Uptake



# Quenching of $\pi$ -Plasmon: Ni Losses Is What's Left



# Quenching of $\pi$ -Plasmon: Ni Losses Is What's Left



# ~6.2 eV Band Gap Measured with EELS

## Hydrogenated graphene:

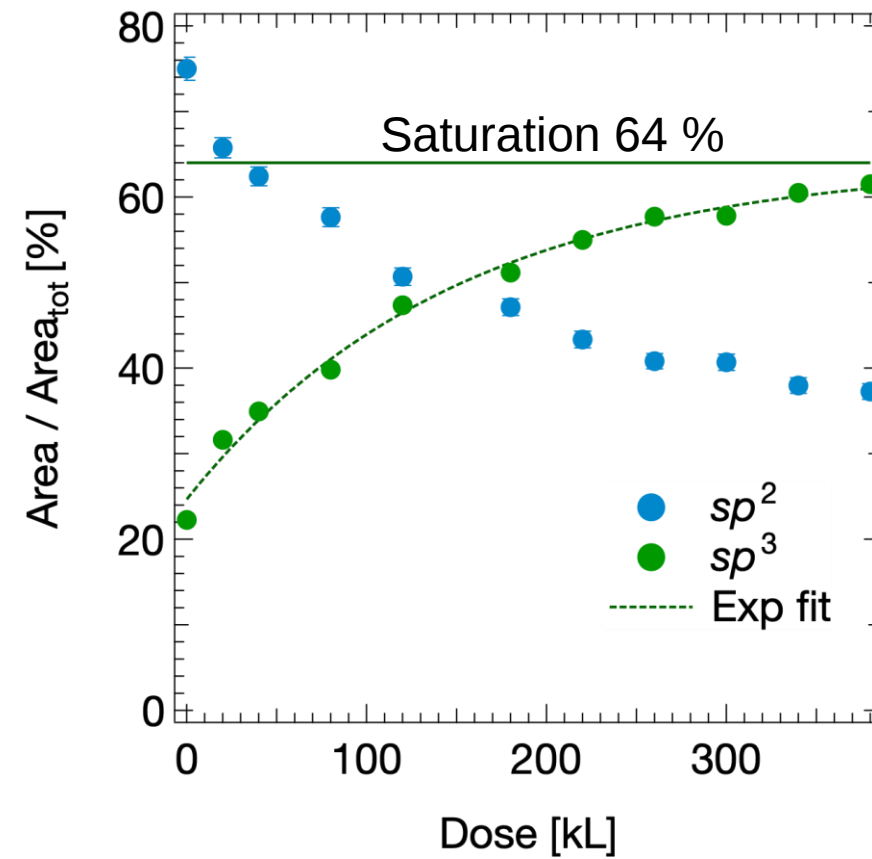
- ❖  $sp^2$  to  $sp^3$  distortion
- ❖ Band gap opening
- ❖ Electronic transition onset  $\propto (E - E_g)^{1/2}$  for direct gap semiconductors
- ❖ EELS measurement <sup>2</sup> and fit with a straight line
- ❖ With this analysis  $E_g \sim 6.2$  eV for both samples





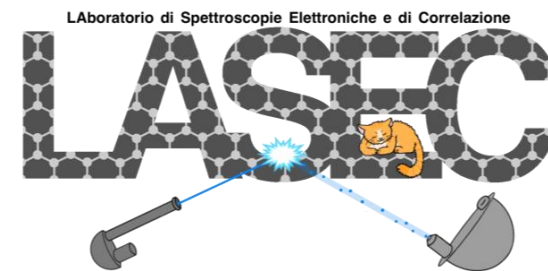


# NPG: We Reached the 64% Saturation





# Stability of Hydrogenated Graphene in Ultra High Vacuum and in Air

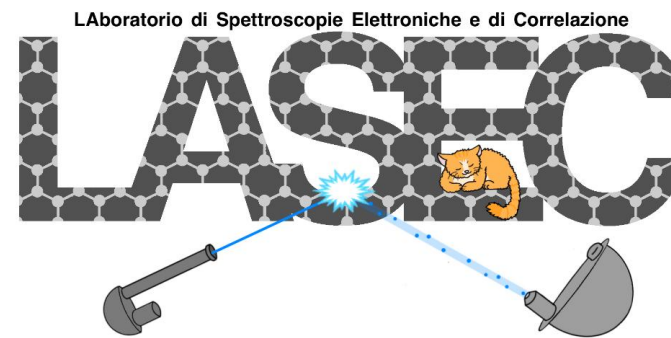








# Measuring the Absolute efficiency of a Micro Channel Plate (MCP) at Roma Tre













# Measuring the Absolute efficiency of a Avalanche Photo Diode (APD) at Roma Tre

