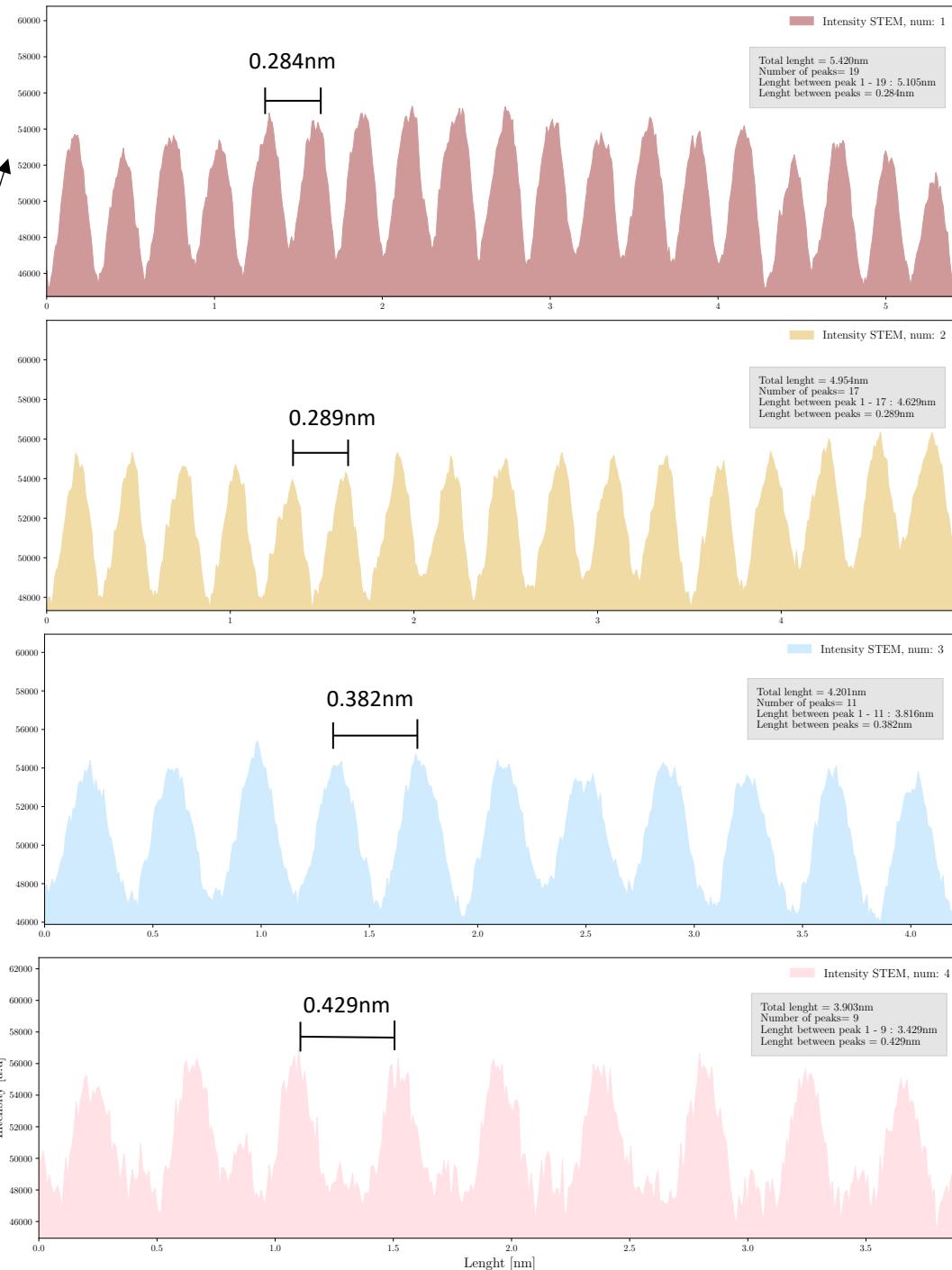
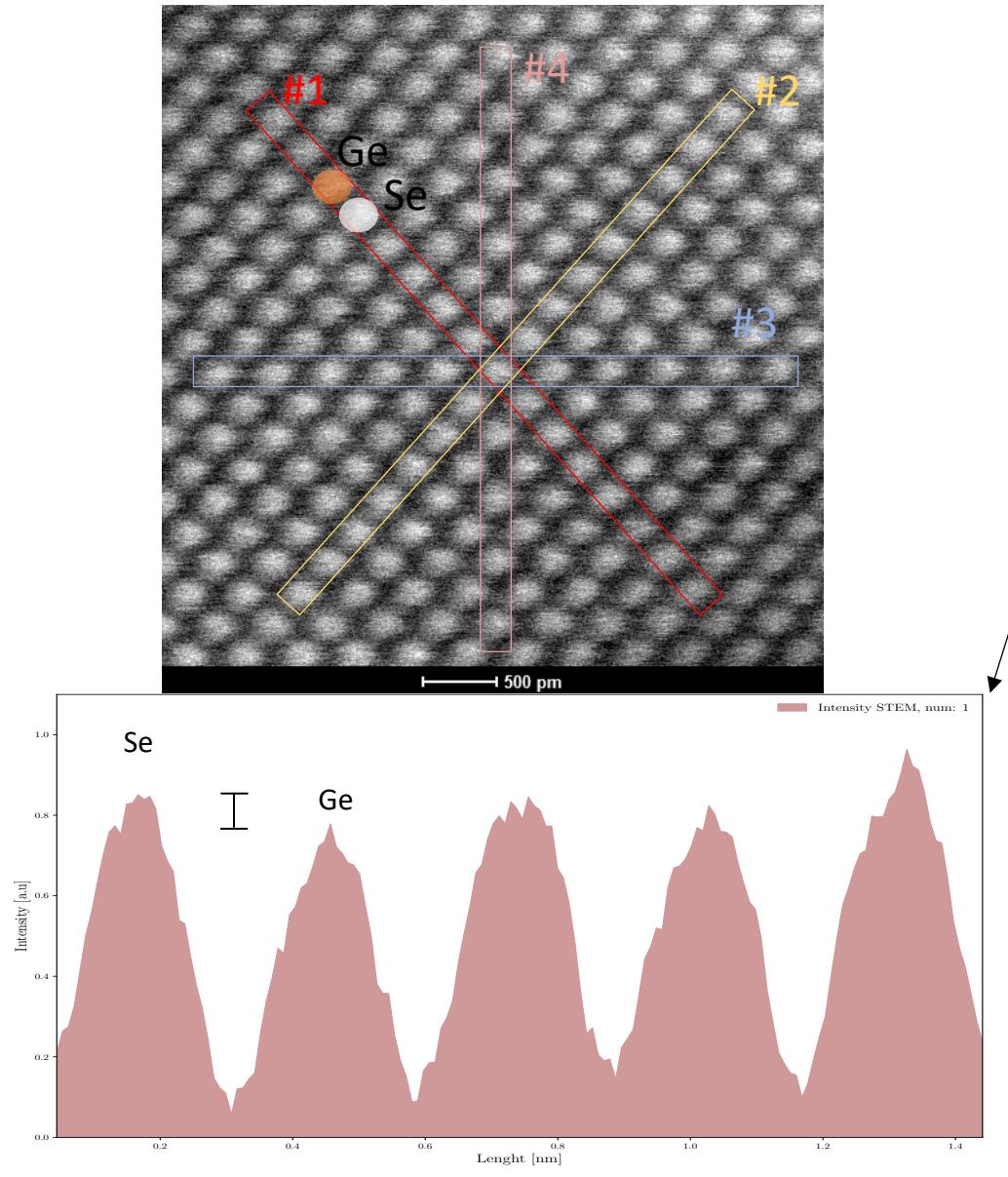
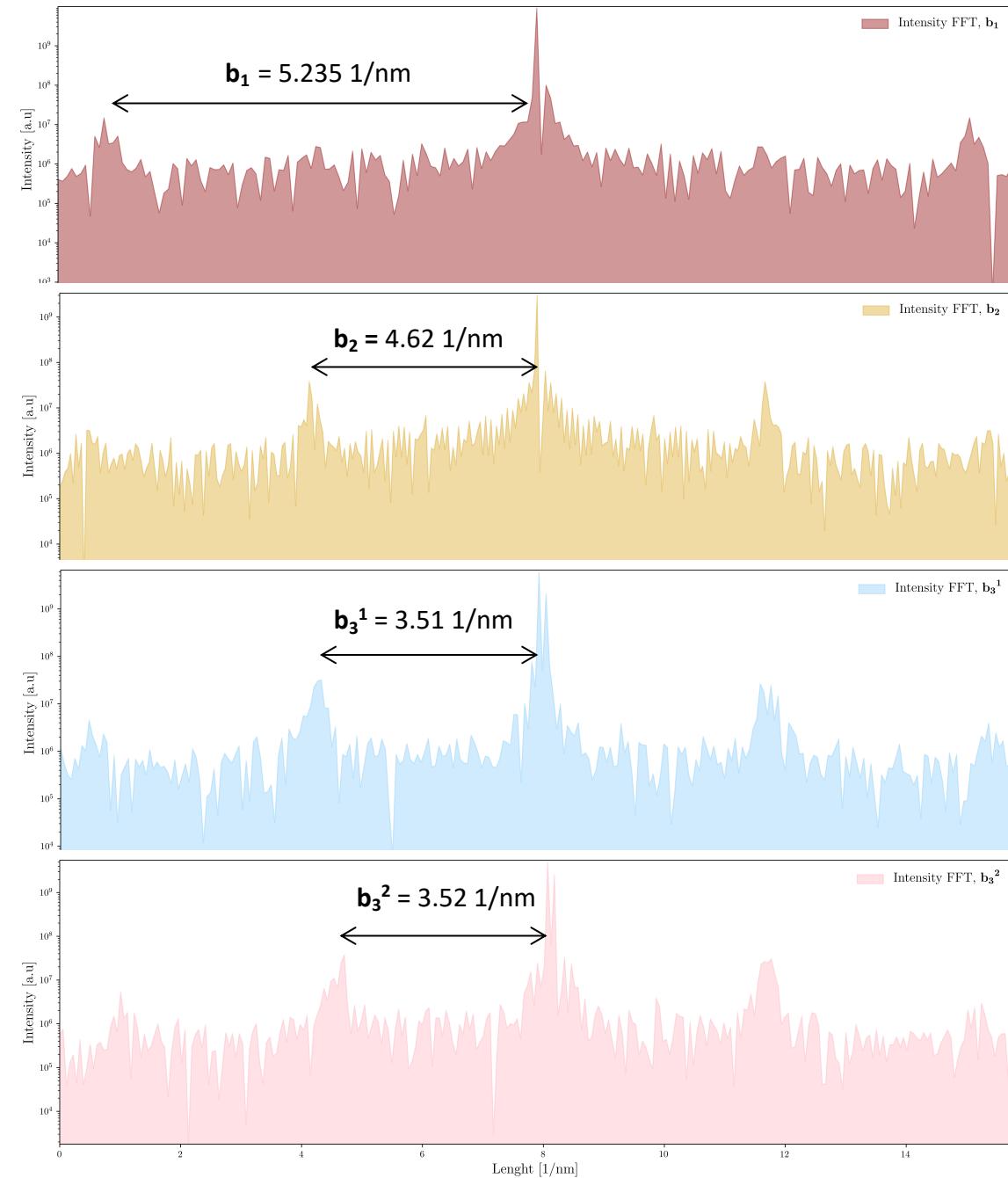
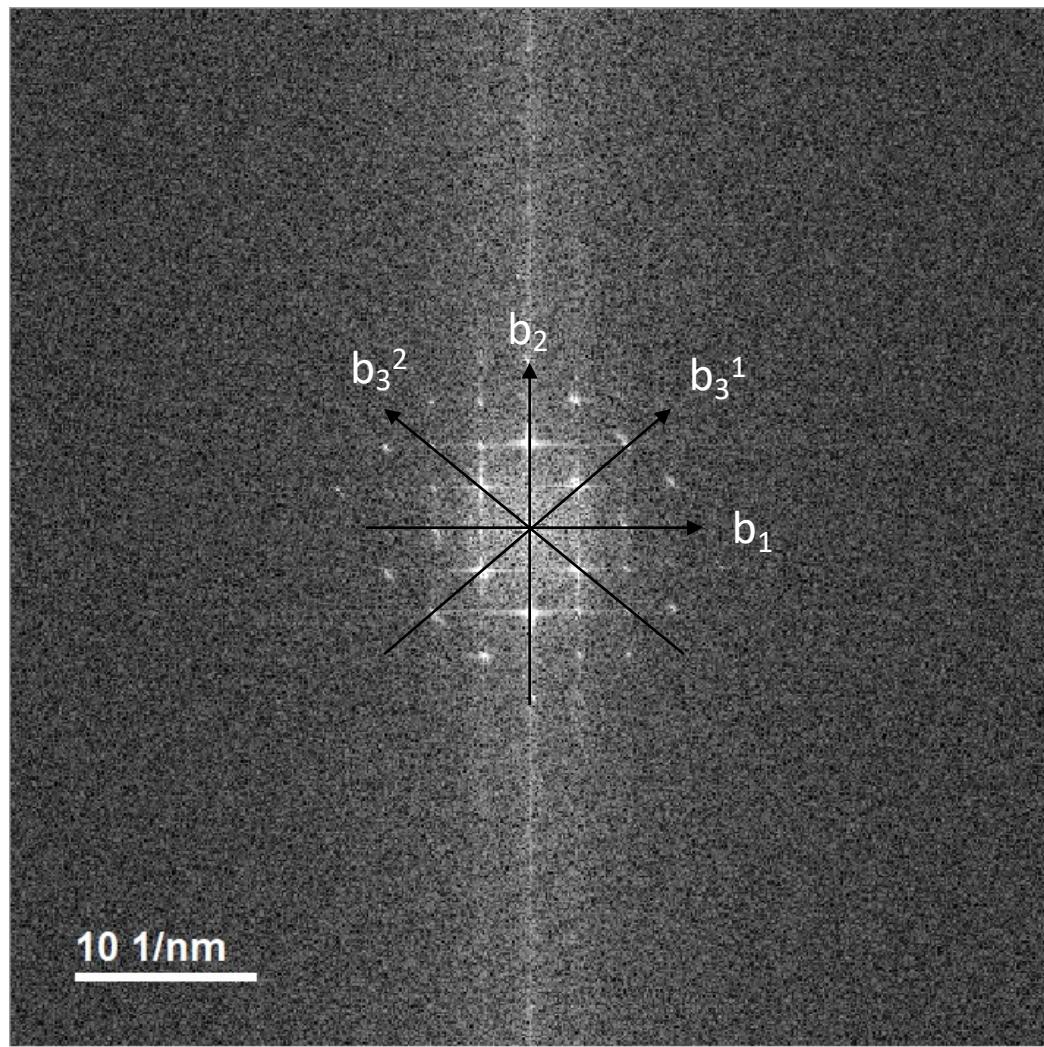


# Supplementary information

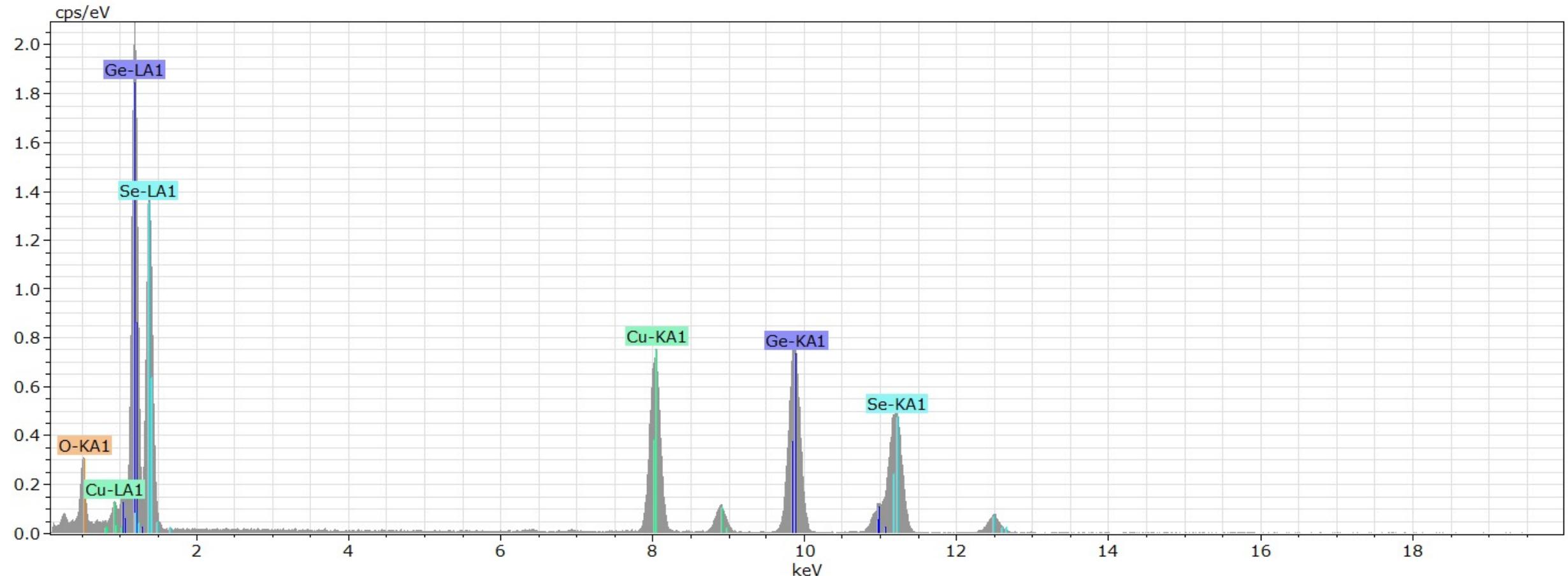
**The Effect on Plasmon Peaks in Quasi Two-Dimensional GeSe by Variation in Thickness & Phases**

# Line Profile of GeSe\_flake\_ROI\_2 along four direction

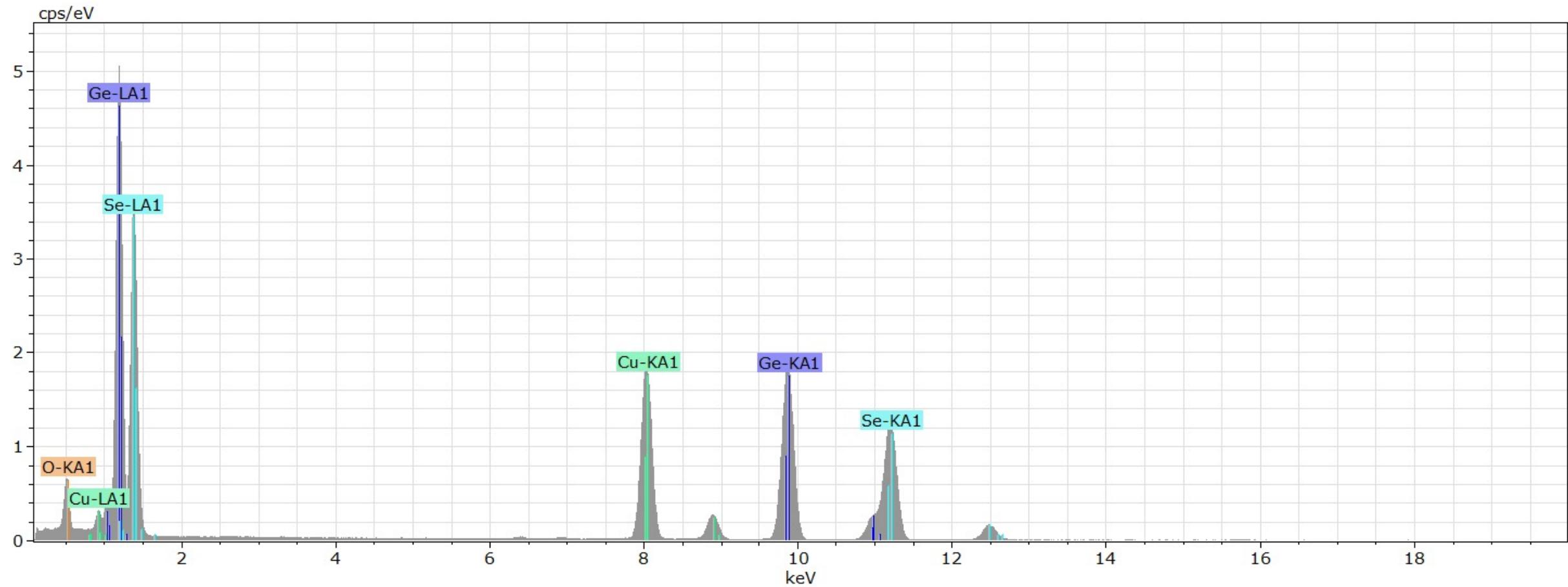




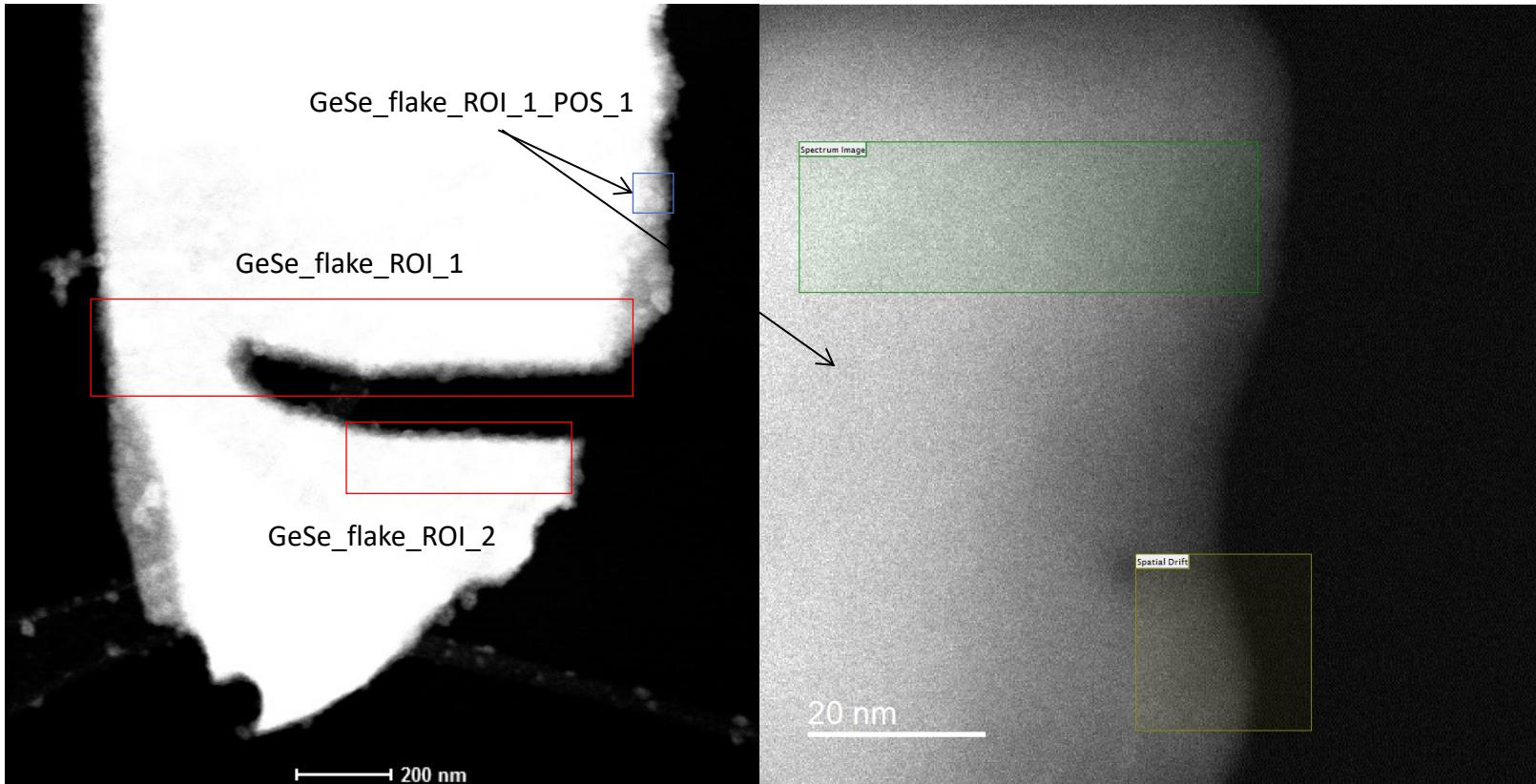
# EDX-spectrum of GeSe\_flake\_ROI\_1



# EDX-spectrum of GeSe\_flake\_ROI\_2

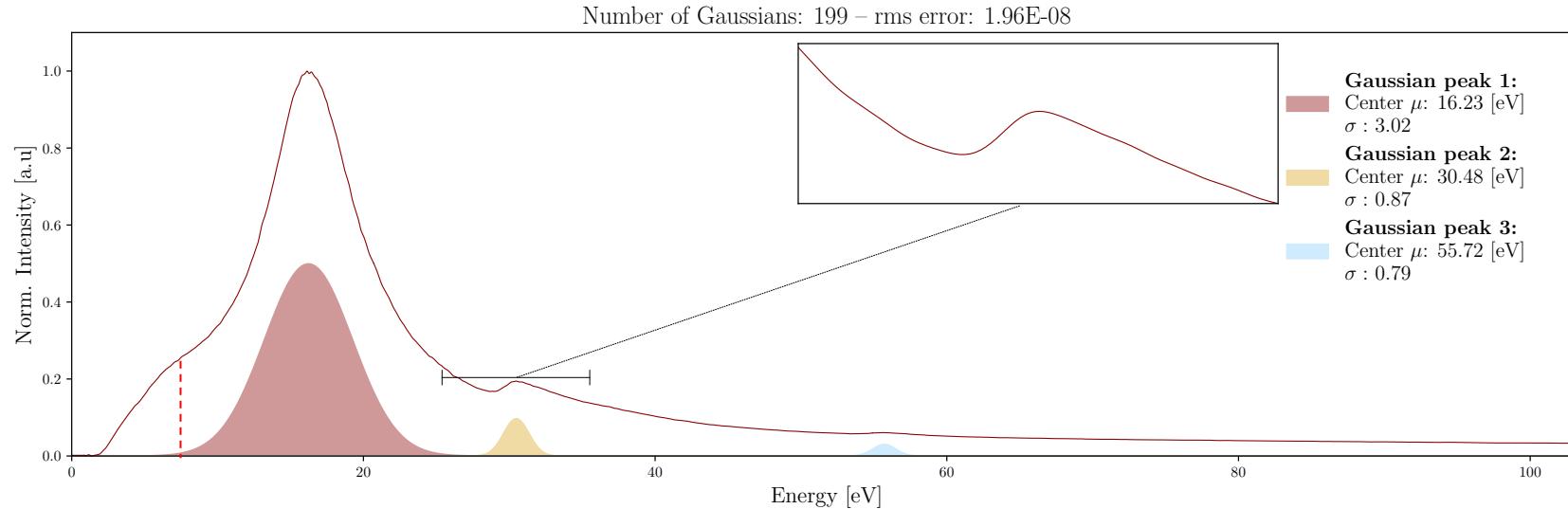
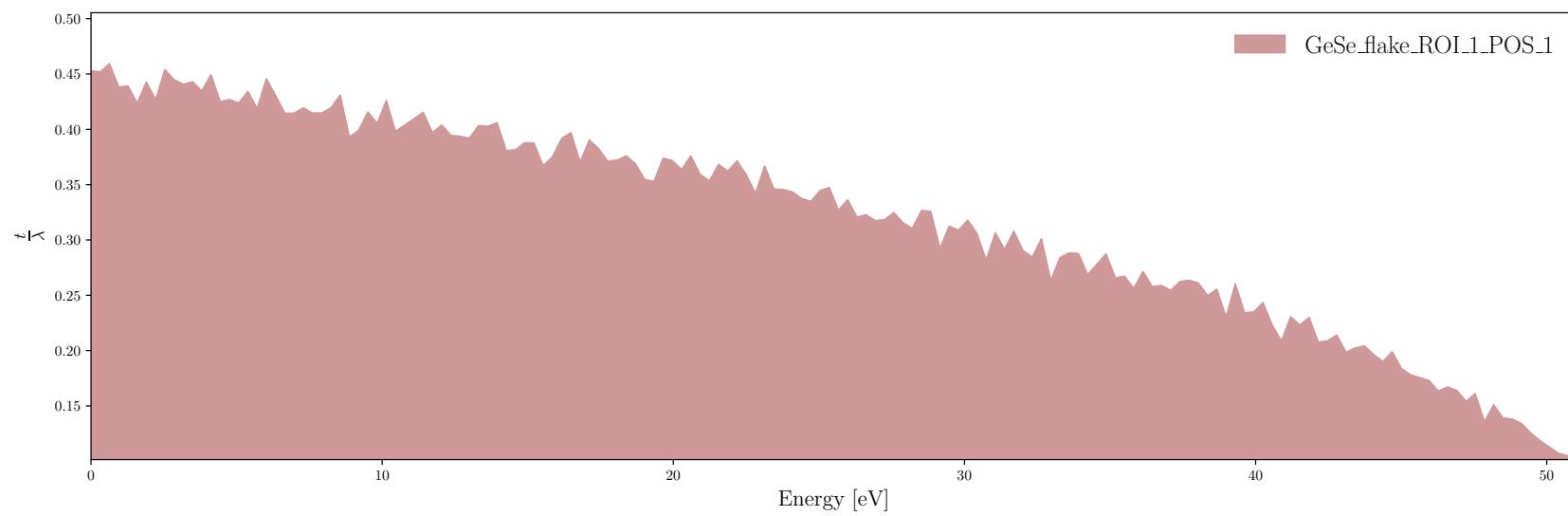
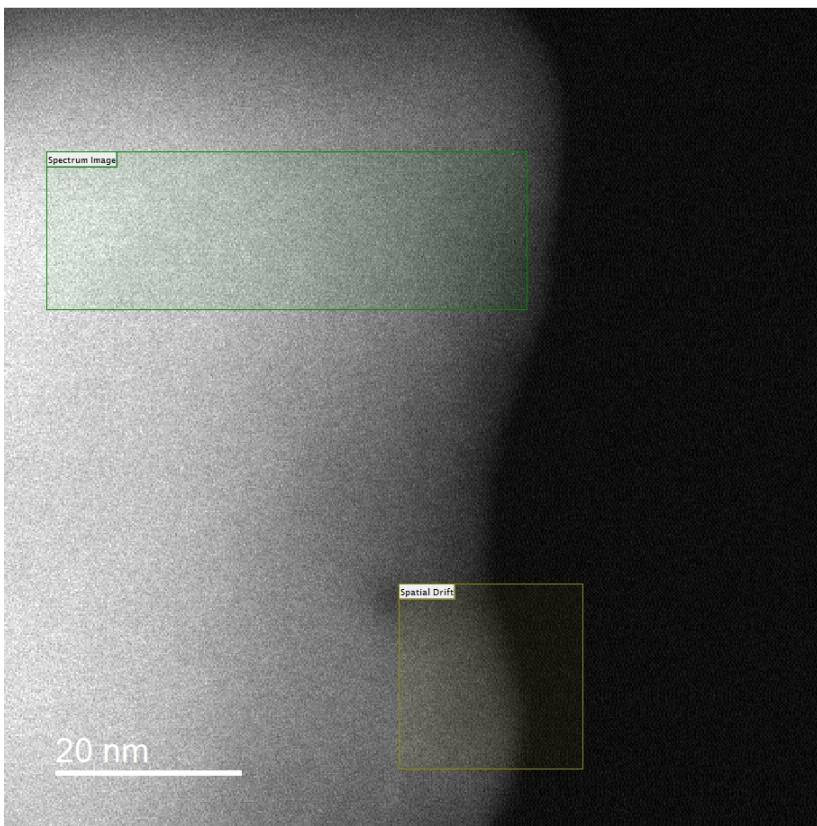


# ADF – GeSe\_flake\_ROI\_1 POS\_1

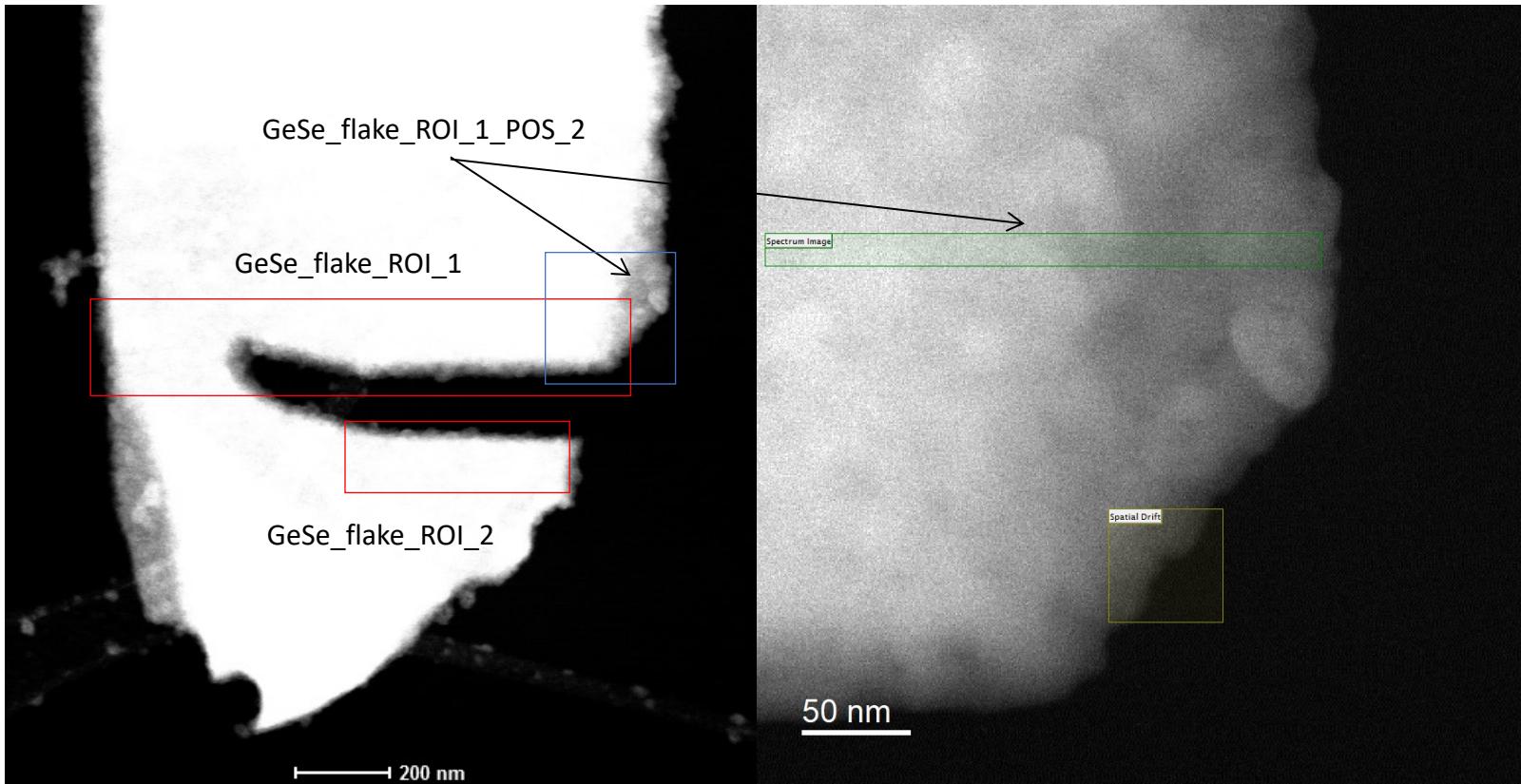


# Thickness profile and High loss spectrum – GeSe\_flake ROI\_1 POS\_1

- High loss spectrum collected from entire region
- Plot from real data
- Inset from estimated function
- Gaussian peaks estimated through peak-finding algorithm

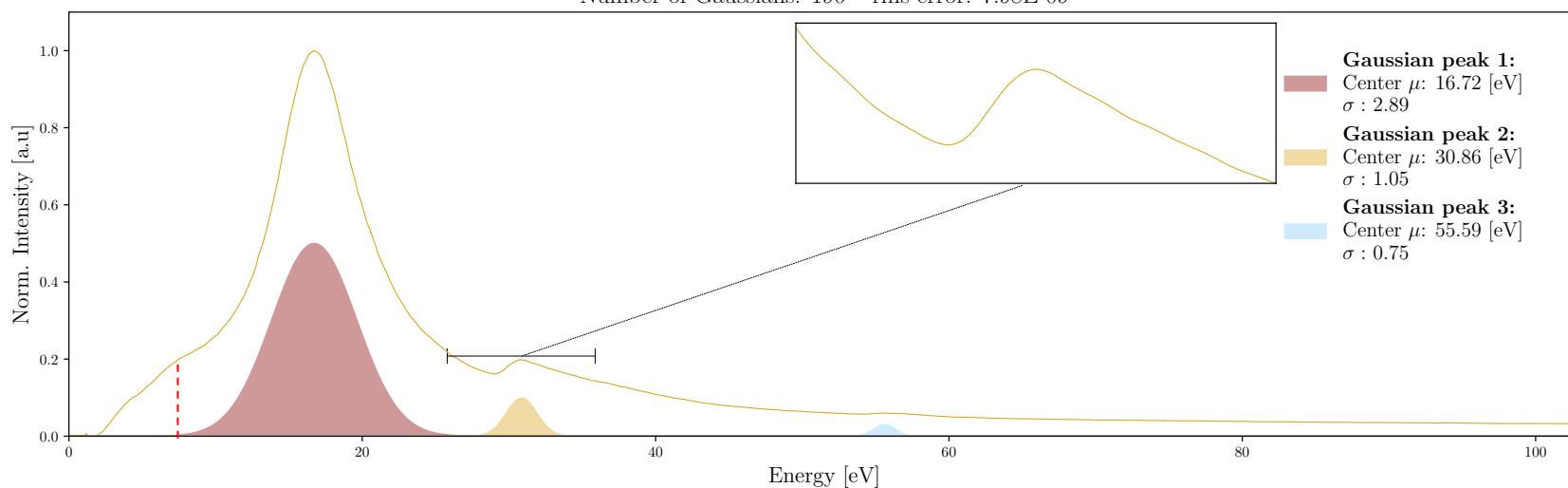
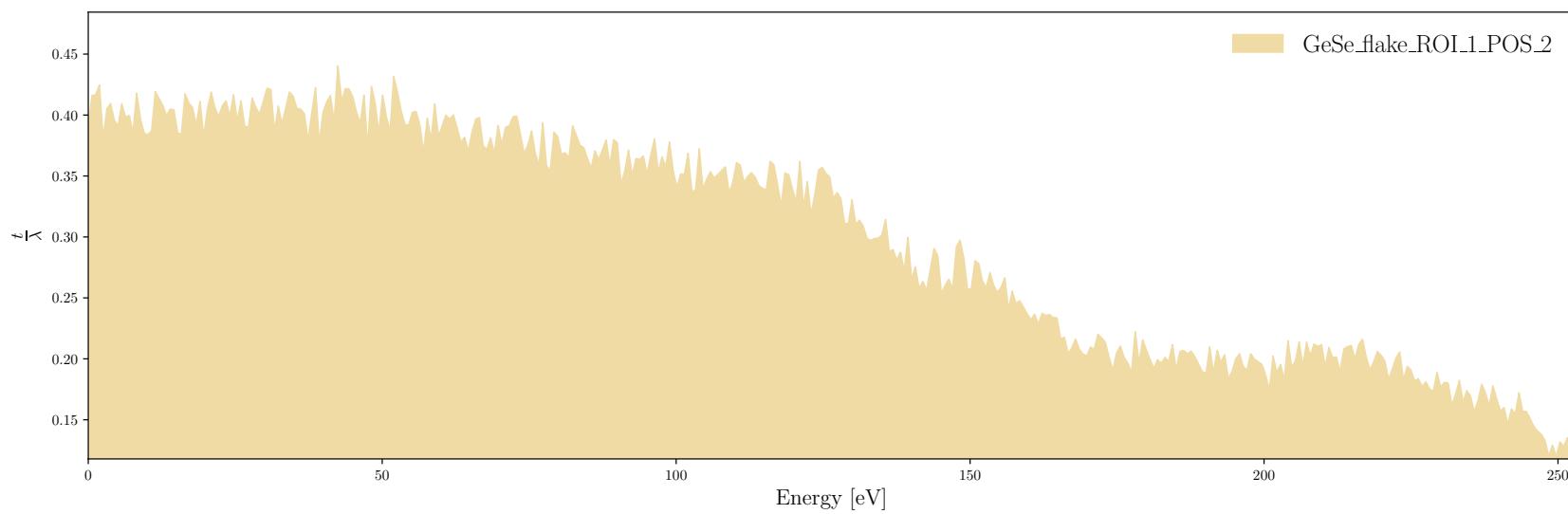
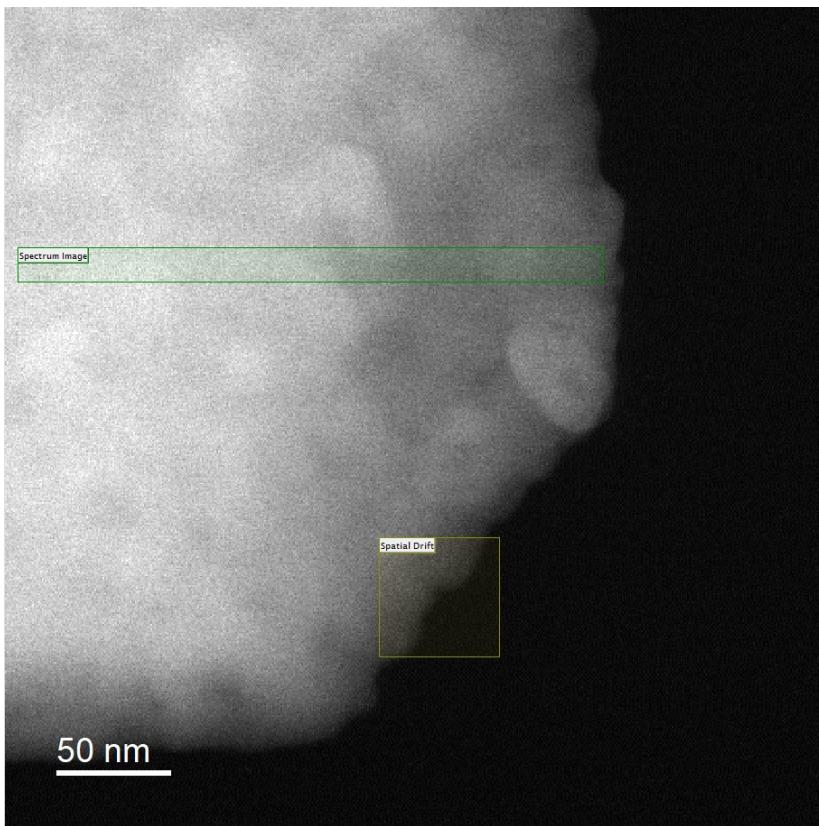


## ADF – GeSe\_flake\_ROI\_1 POS\_2

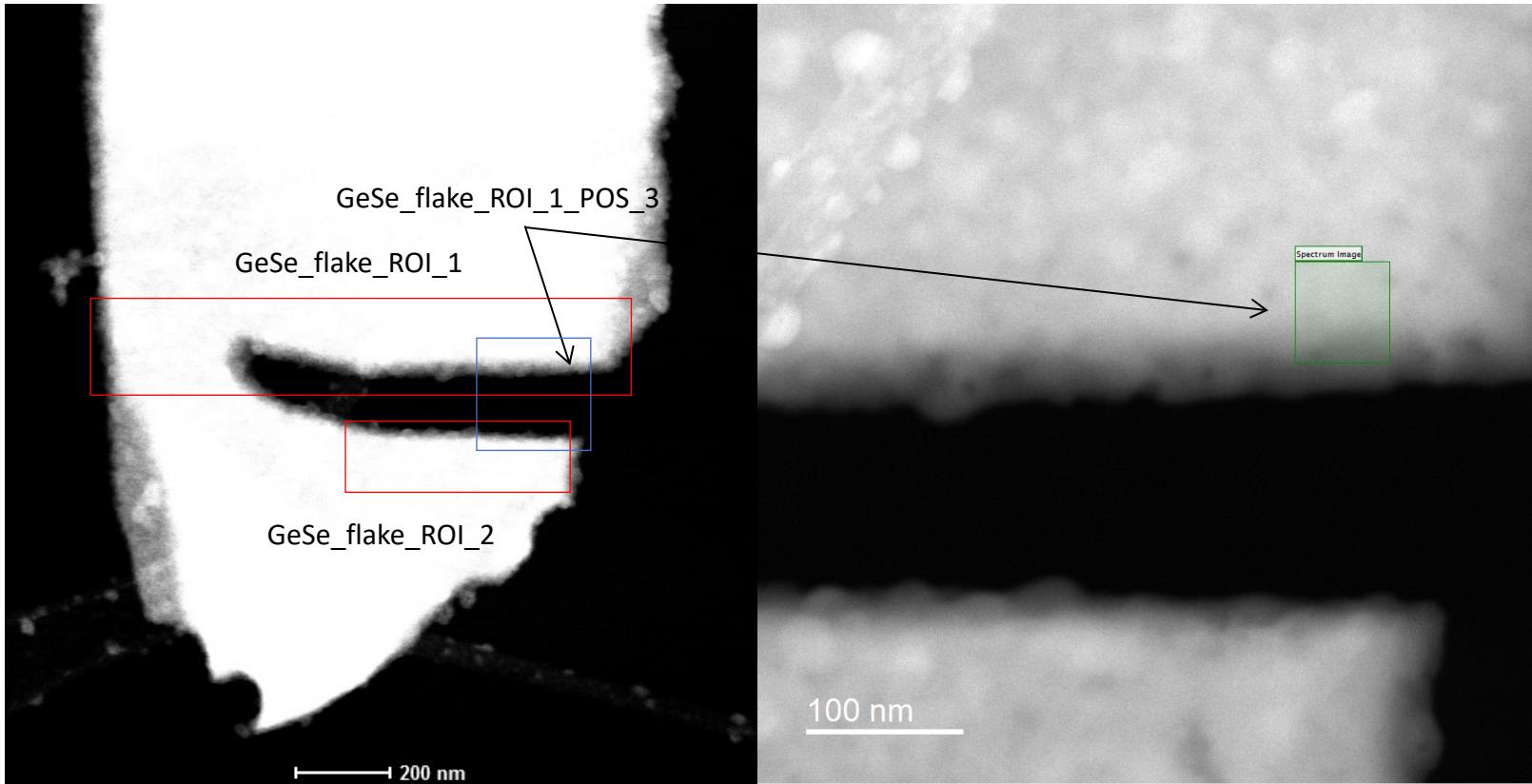


# Thickness profile and High loss spectrum – GeSe\_flake ROI\_1 POS\_2

- High loss spectrum collected from entire region
- Plot from real data
- Inset from estimated function
- Gaussian peaks estimated through peak-finding algorithm

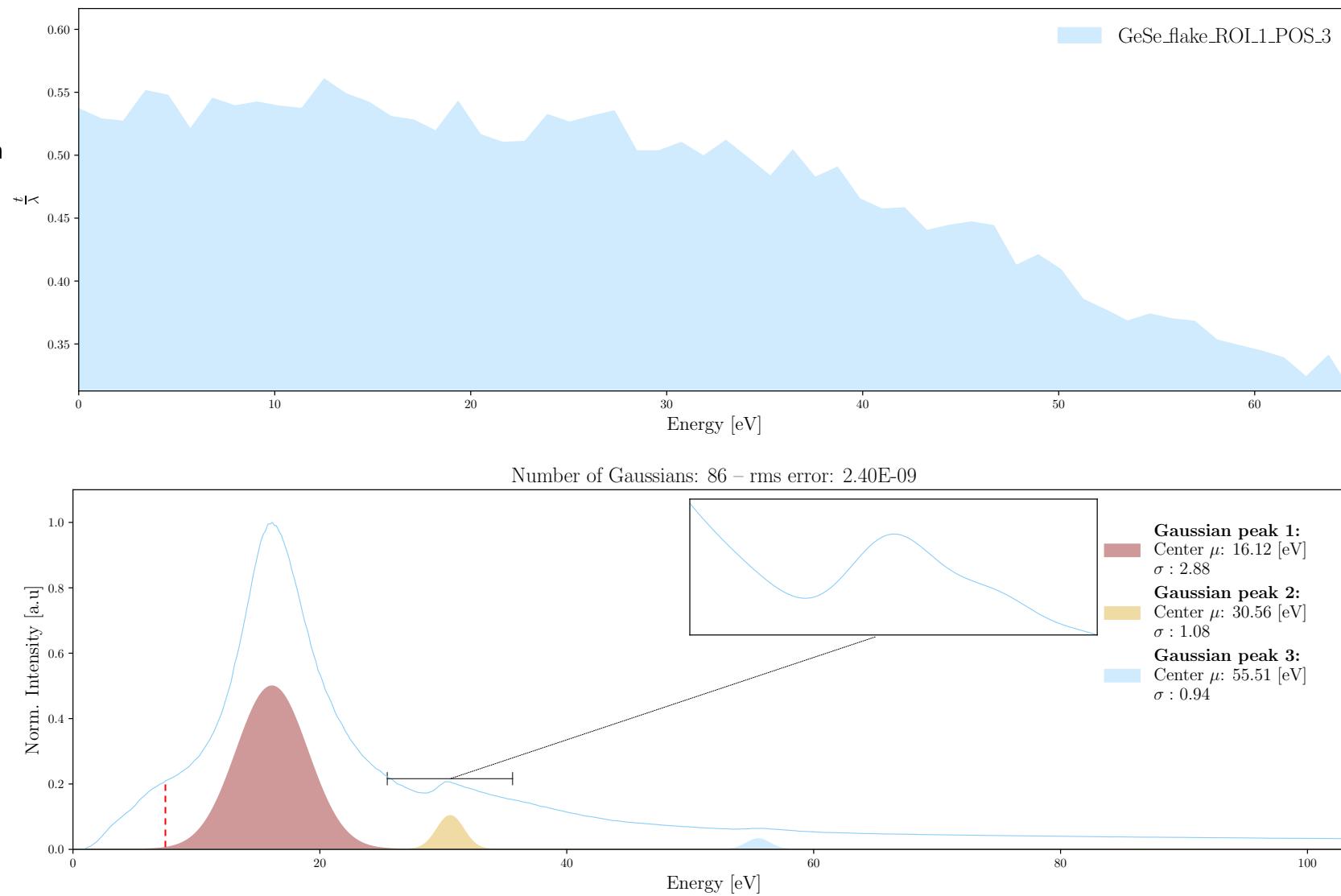
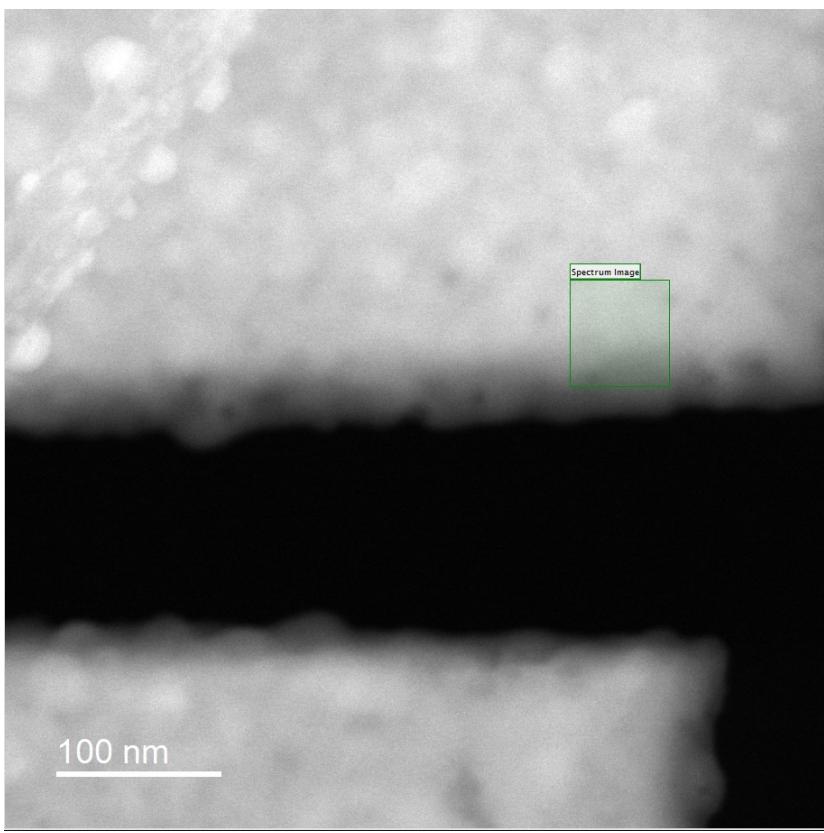


# ADF – GeSe\_flake\_ROI\_1 POS\_3

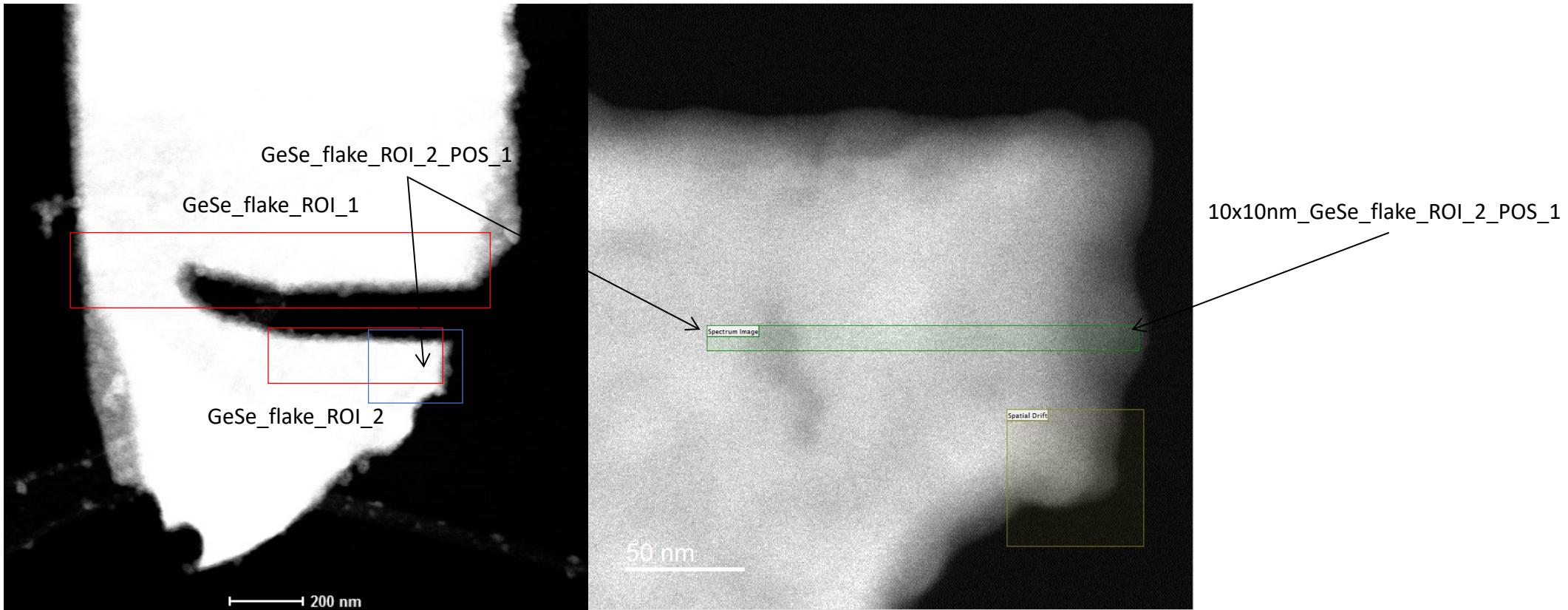


# Thickness profile and High loss spectrum – GeSe\_flake ROI\_1 POS\_3

- High loss spectrum collected from entire region
- Plot from real data
- Inset from estimated function
- Gaussian peaks estimated through peak-finding algorithm

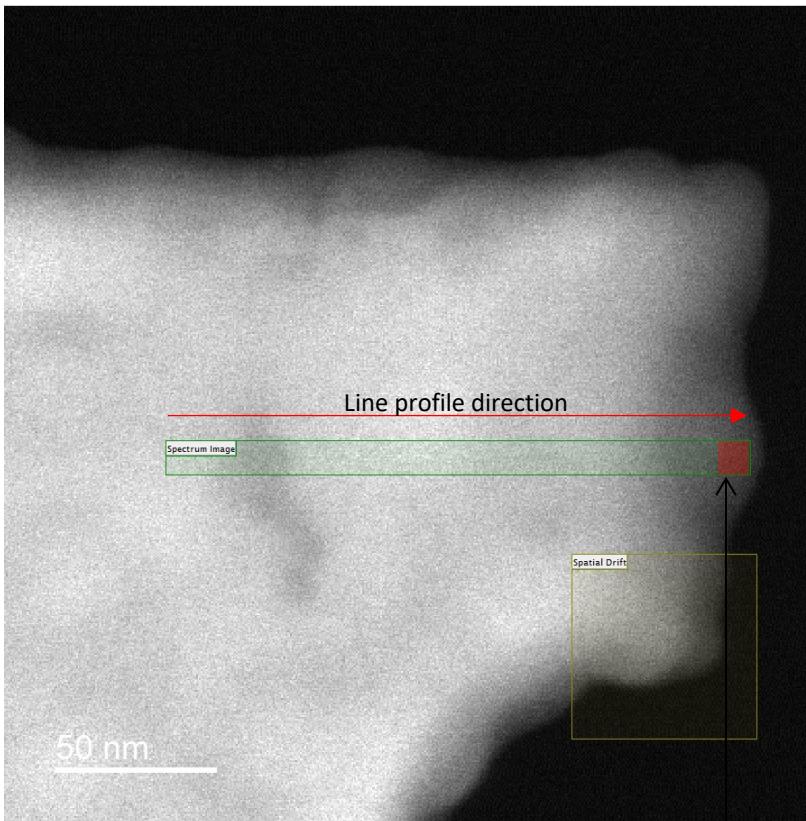


# ADF – GeSe\_flake\_ROI\_2 POS\_1

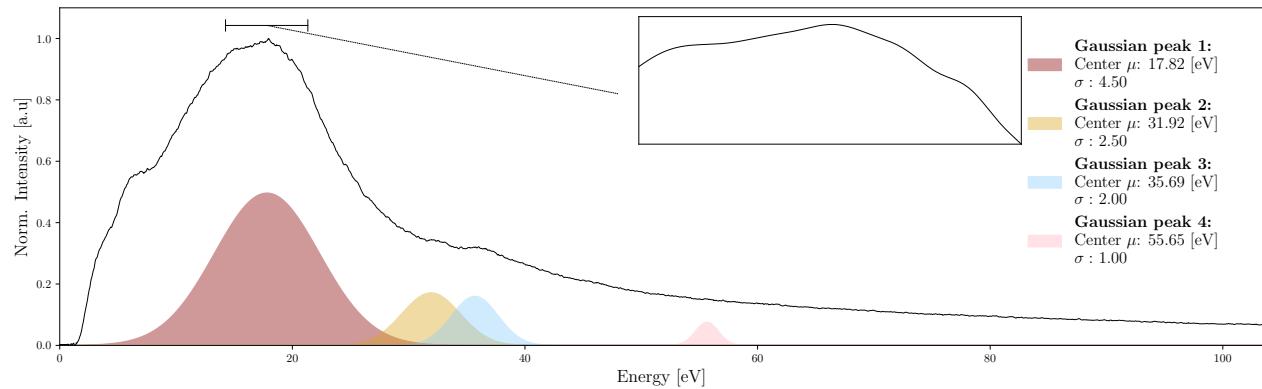
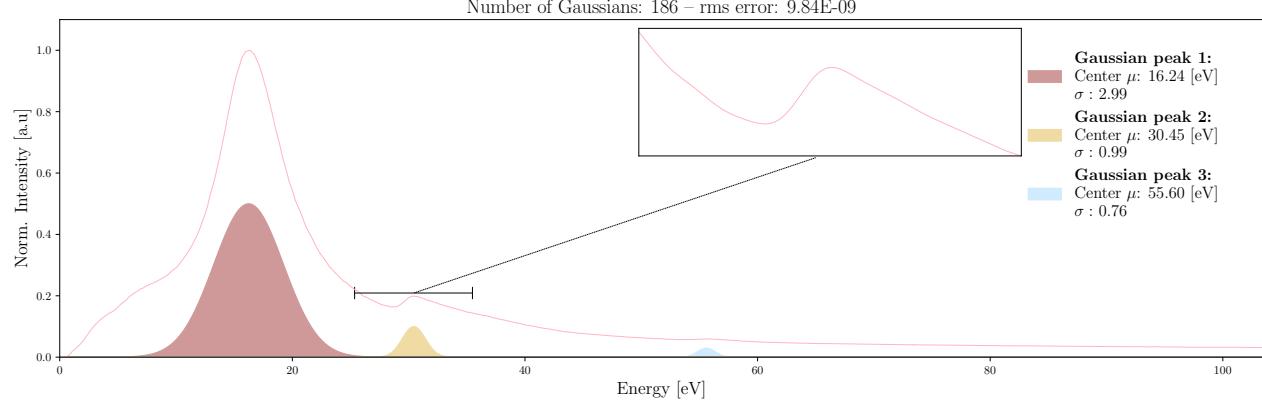
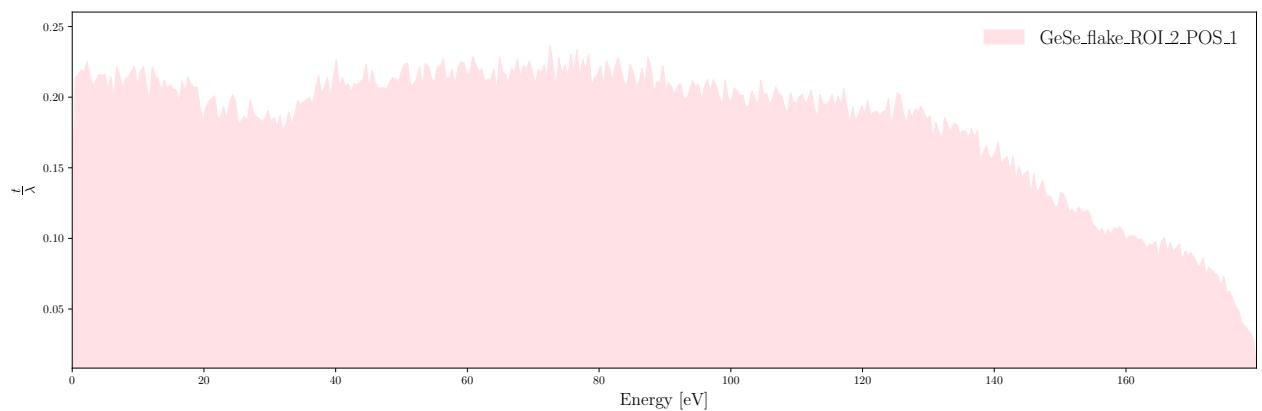


# Thickness profile and High loss spectrum – GeSe\_flake ROI\_2 POS\_1

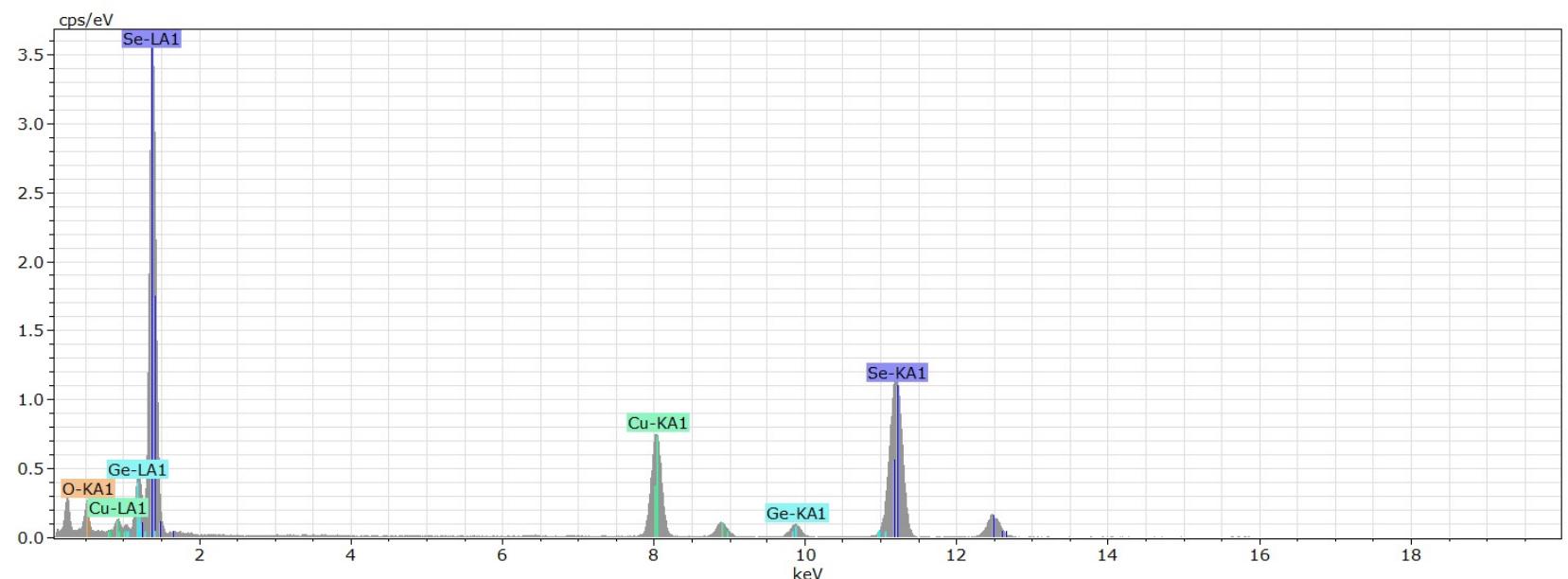
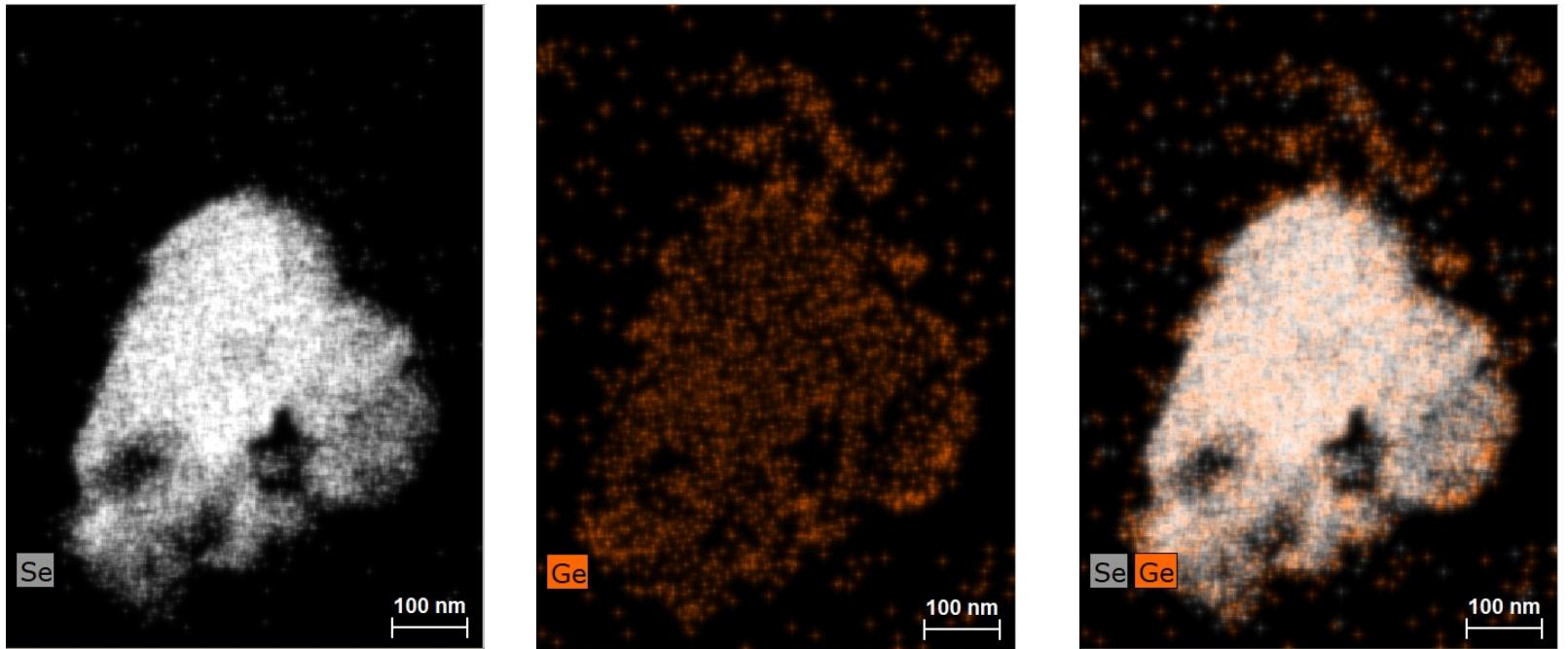
- High loss spectrum collected from entire region
- Plot from real data
- Inset from estimated function
- Gaussian peaks estimated through peak-finding algorithm



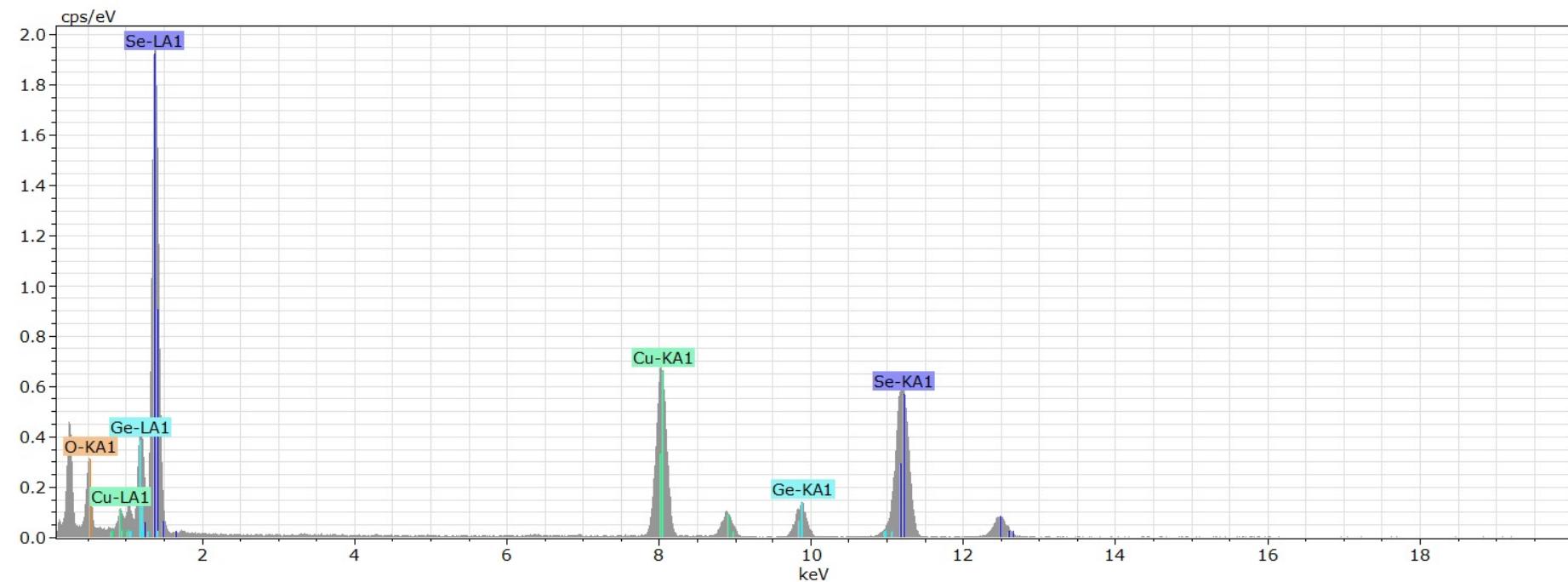
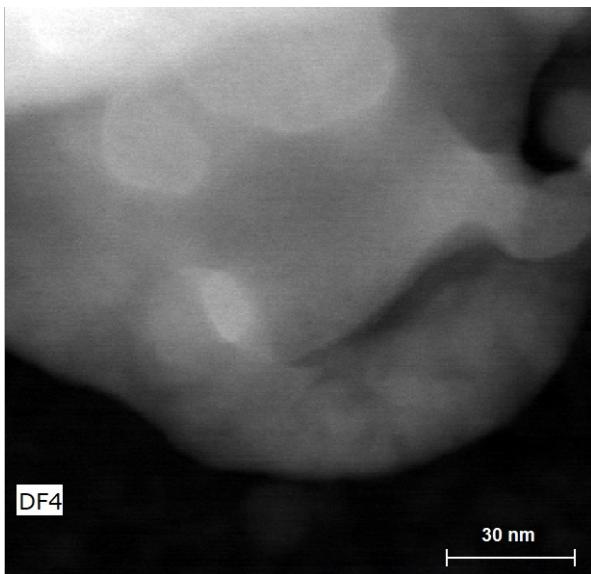
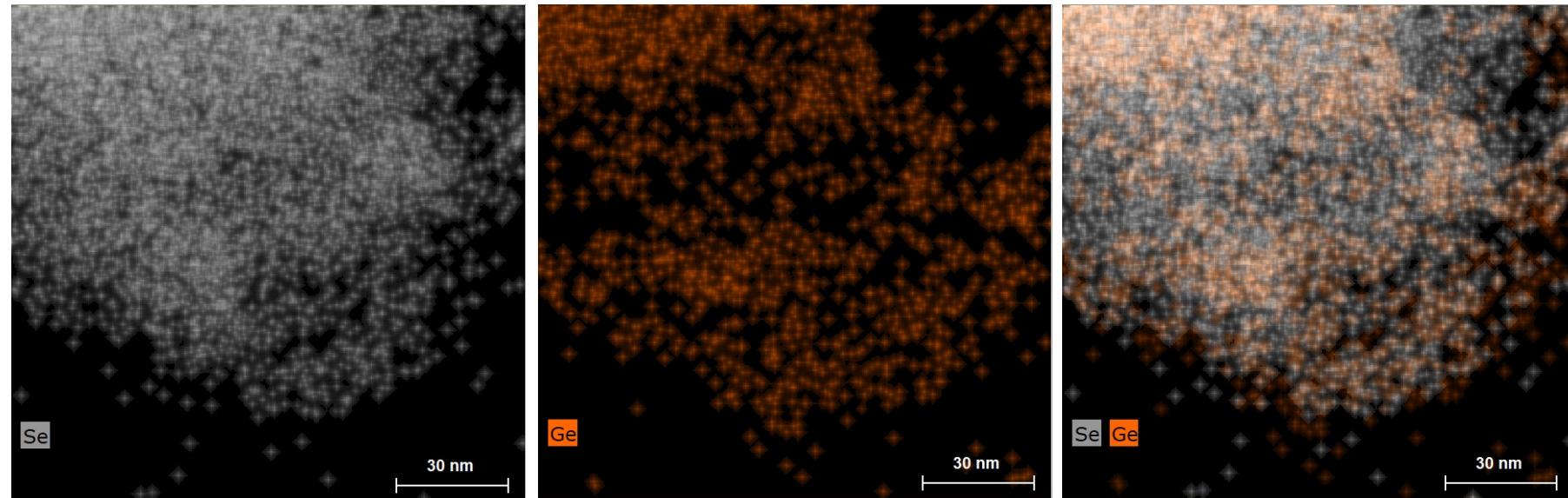
10x10nm\_GeSe\_flake\_ROI\_2\_POS\_1



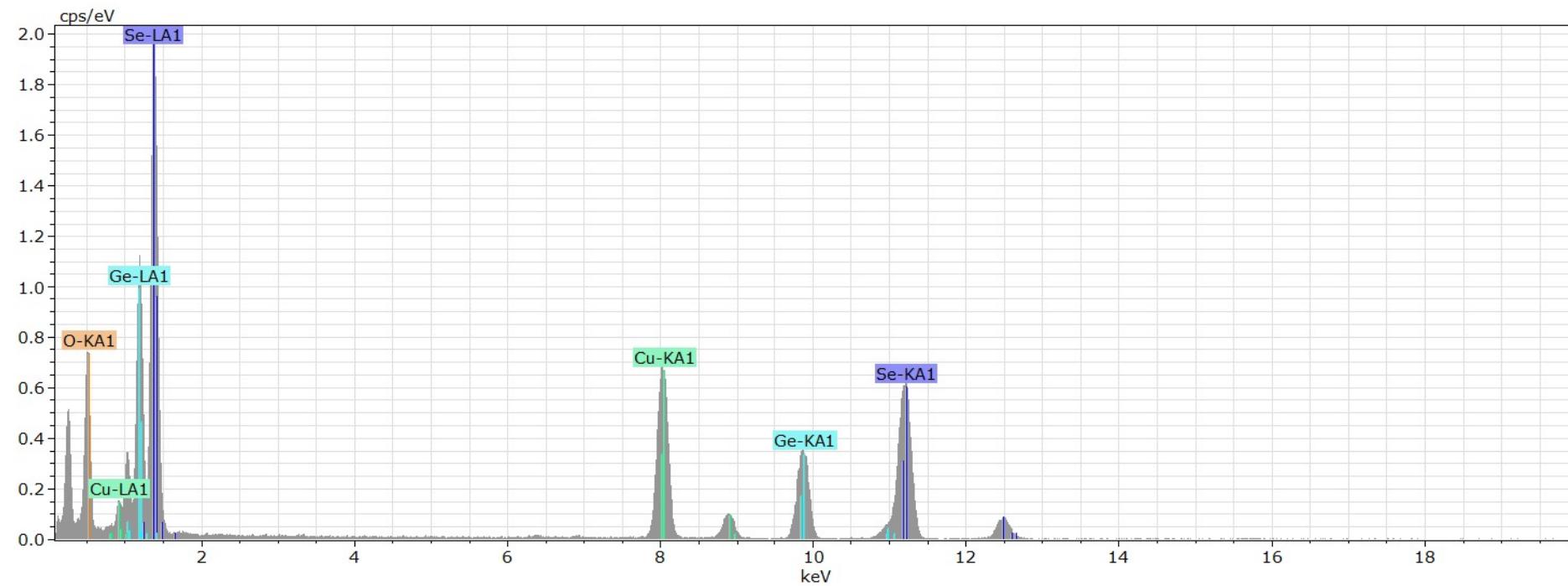
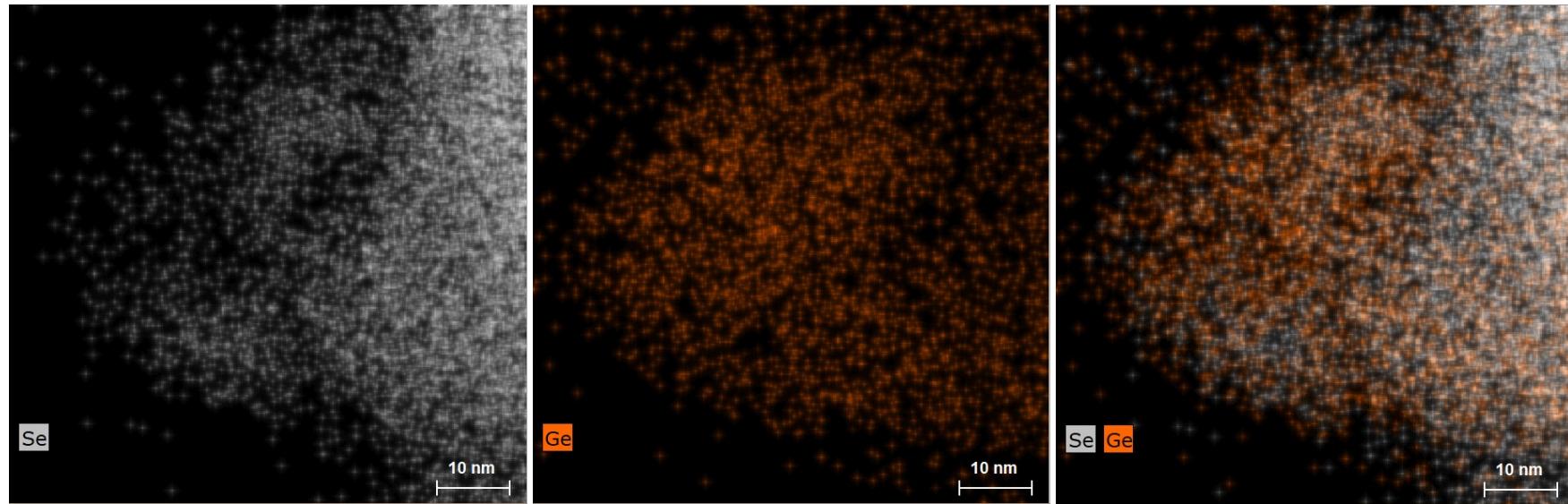
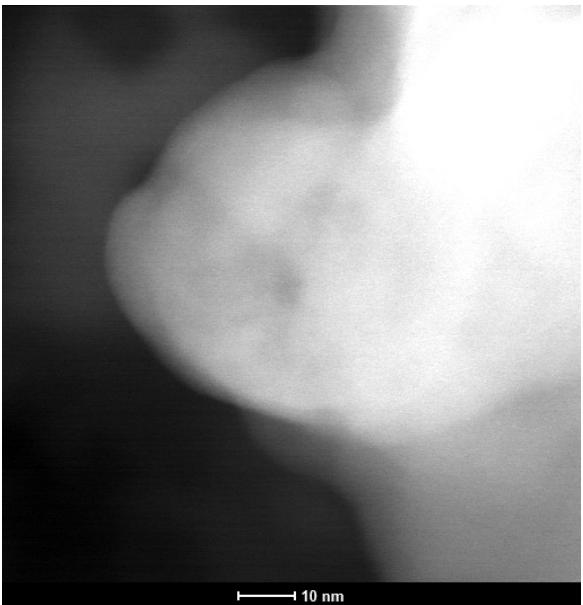
EDX map & spectrum of  
Accumulation\_TOT



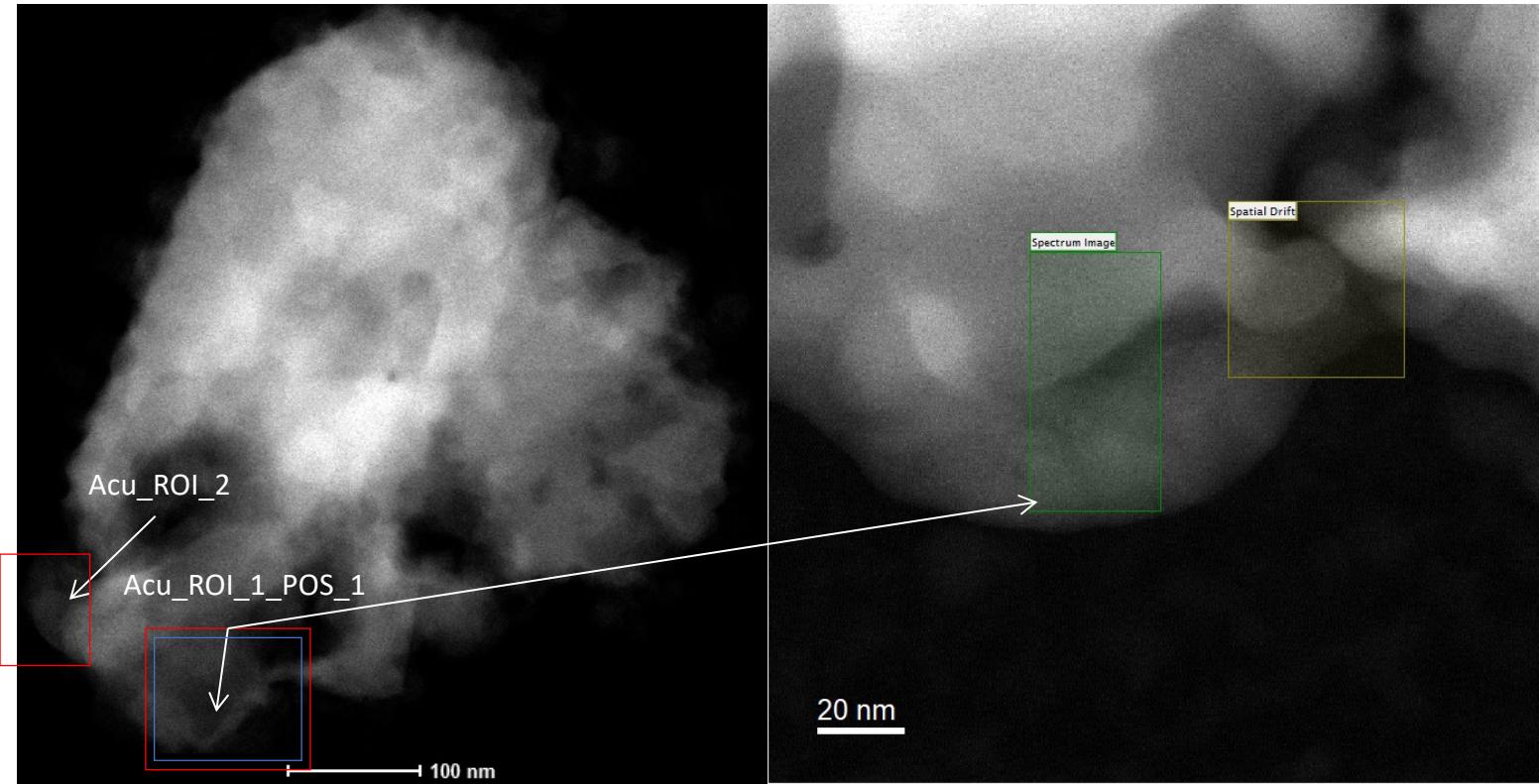
## EDX map & spectrum of Accumulation\_ROI\_1



# EDX map & spectrum of Accumulation\_ROI\_2

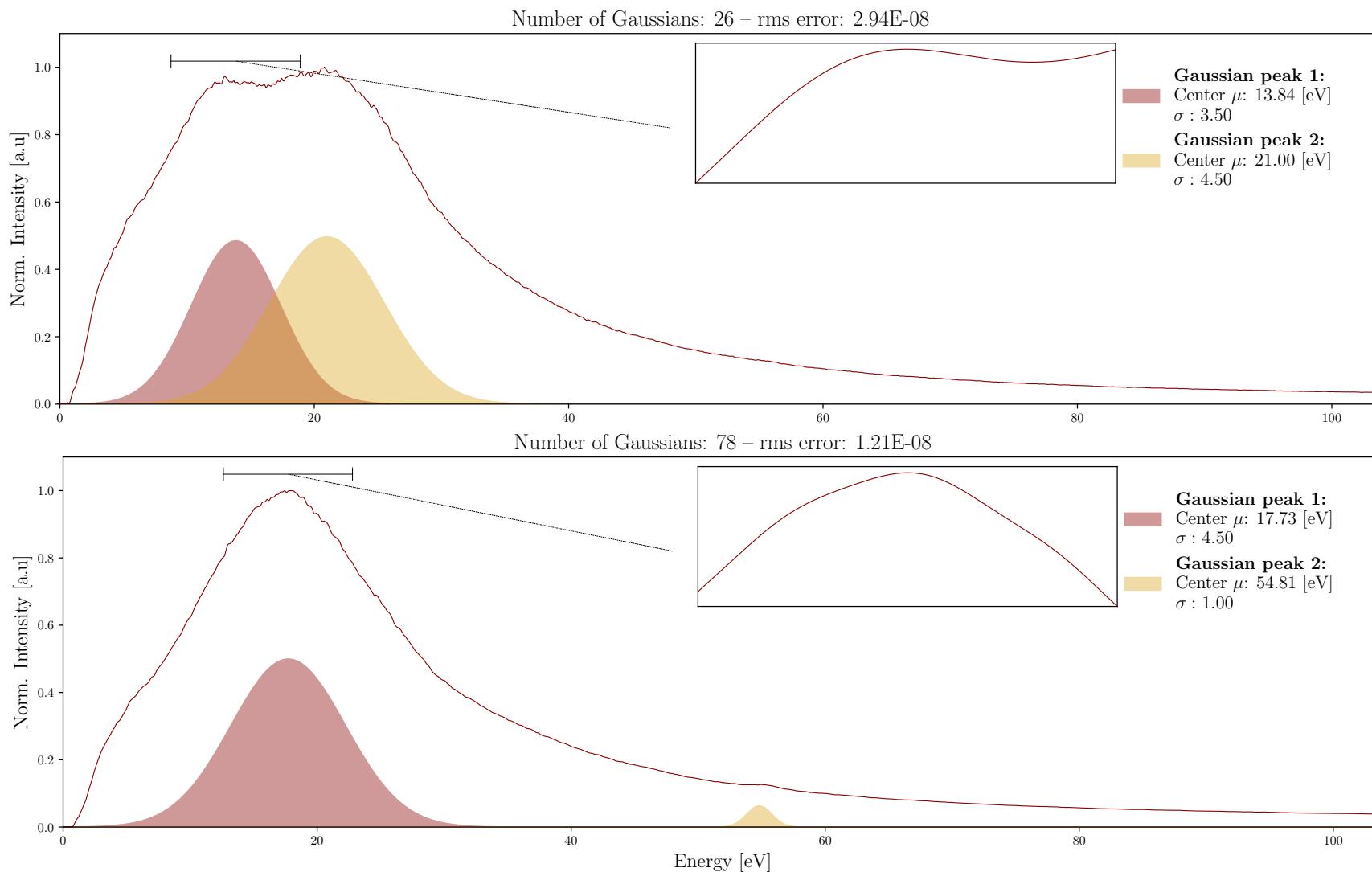
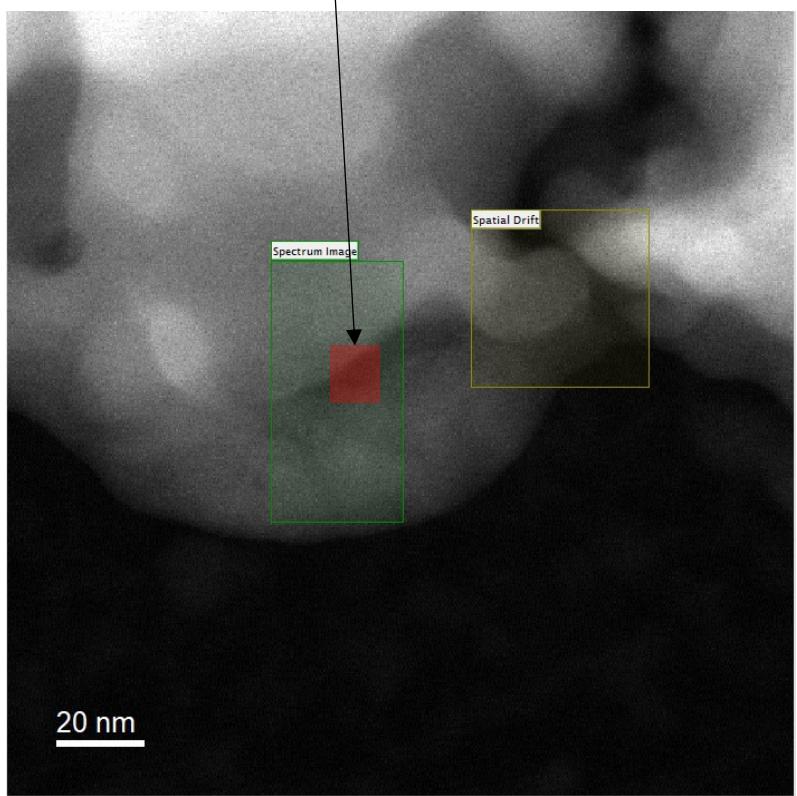


# ADF – GeSe\_Accumulation\_ROI\_1

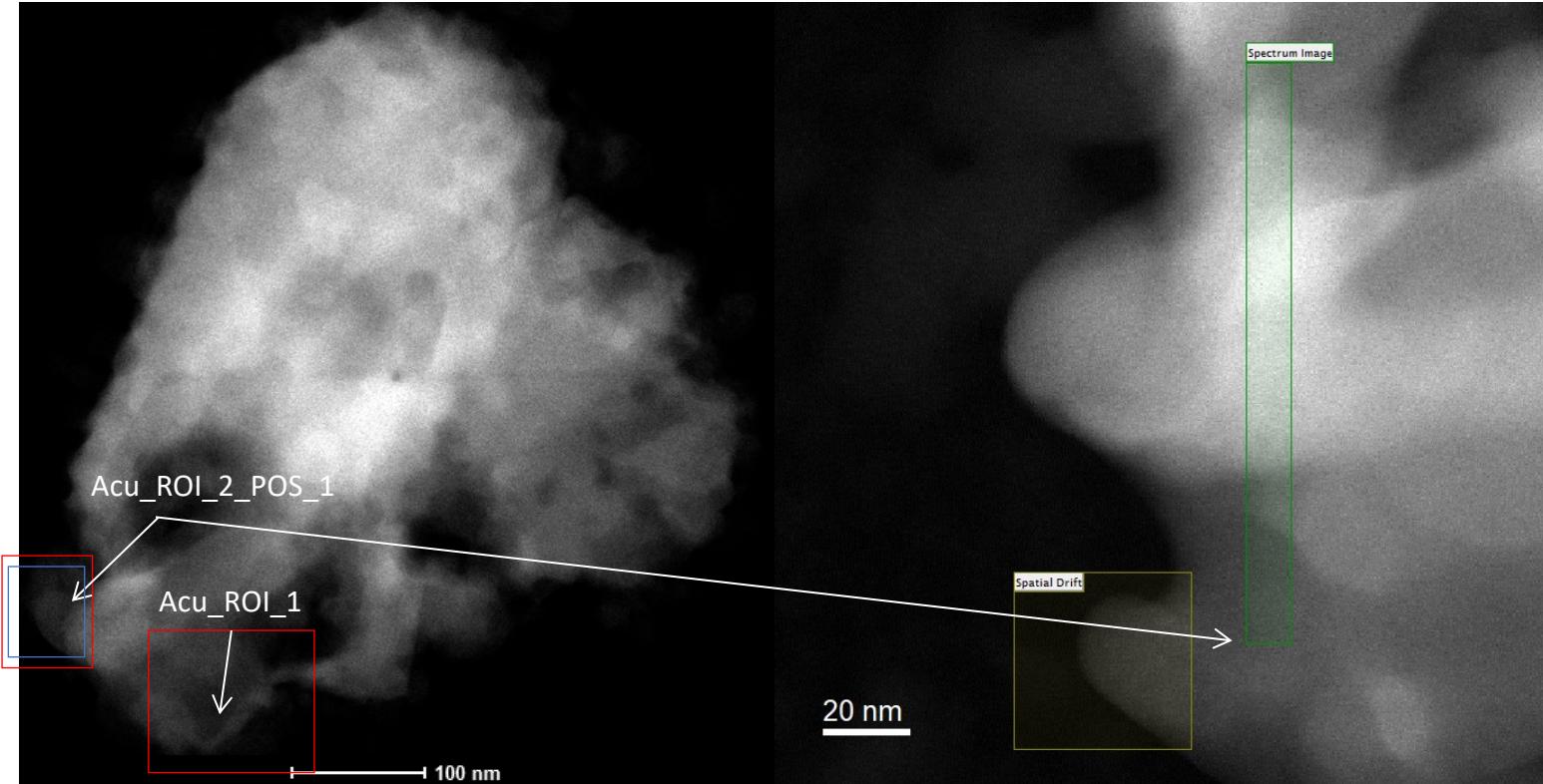


# High loss spectrum – GeSe\_Accumulation\_ROI\_1

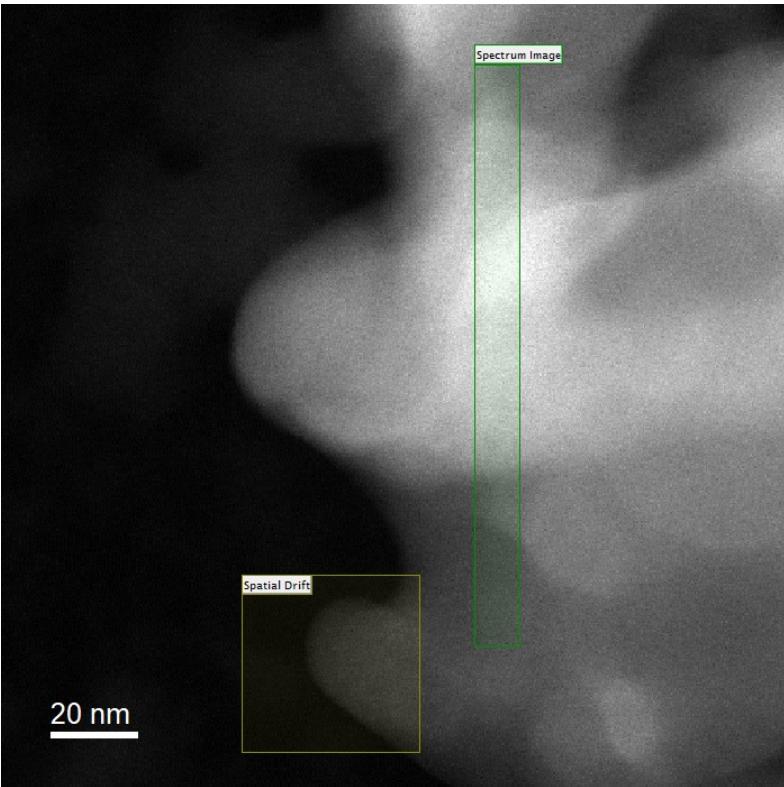
10x10nm\_GeSe\_Accumulation\_ROI\_1



# ADF – GeSe\_Accumulation\_ROI\_2 POS\_1

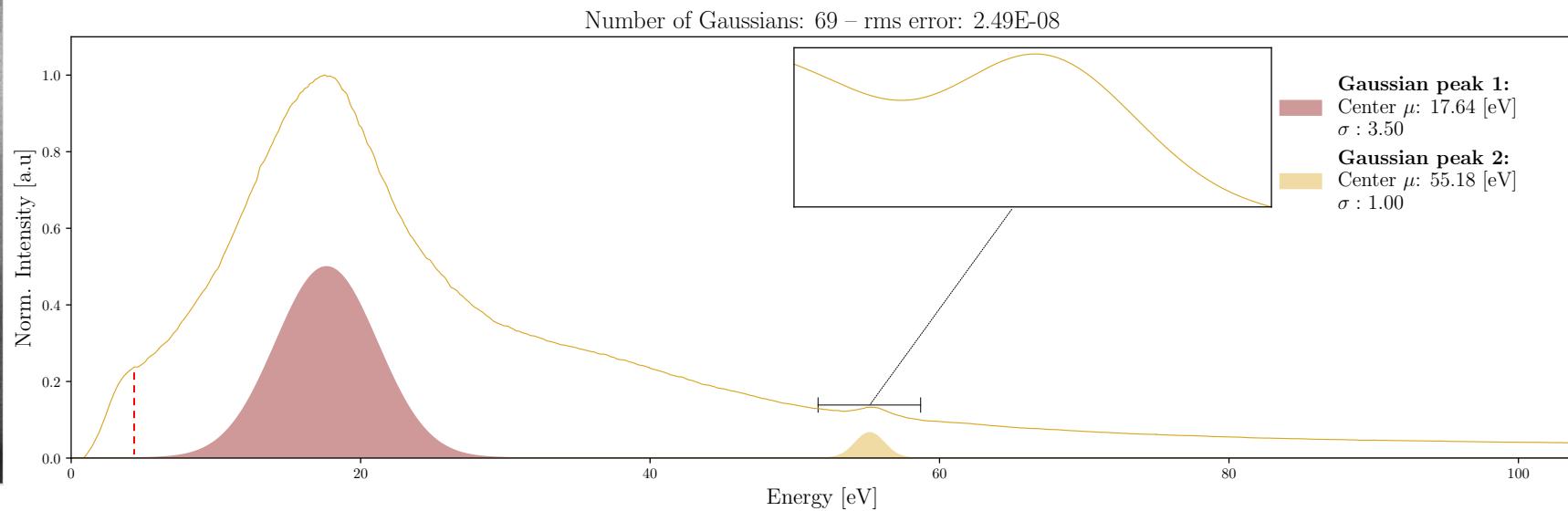


# High loss spectrum – GeSe\_Accumulation\_ROI\_2\_POS\_1

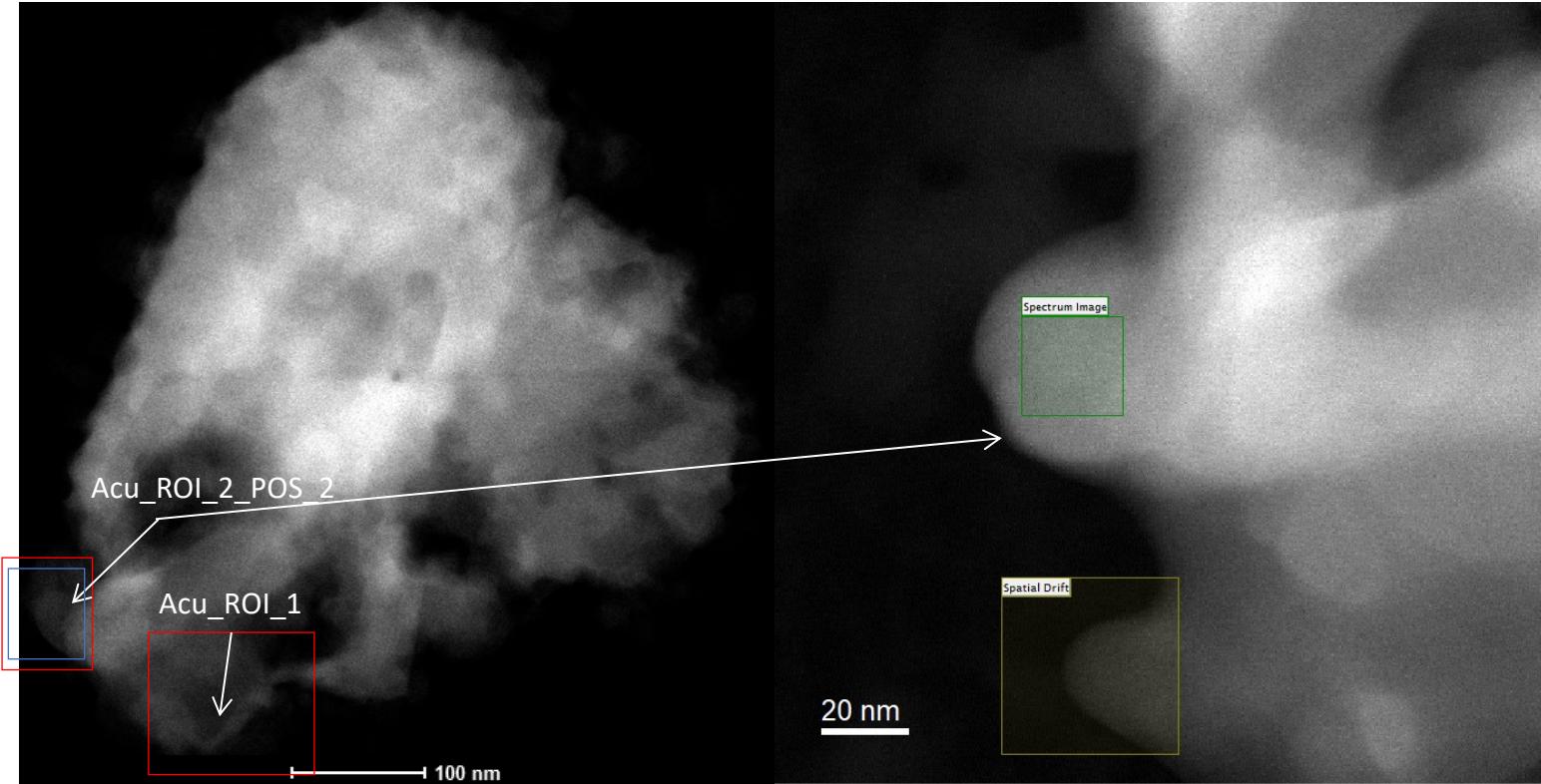


## Main peak features:

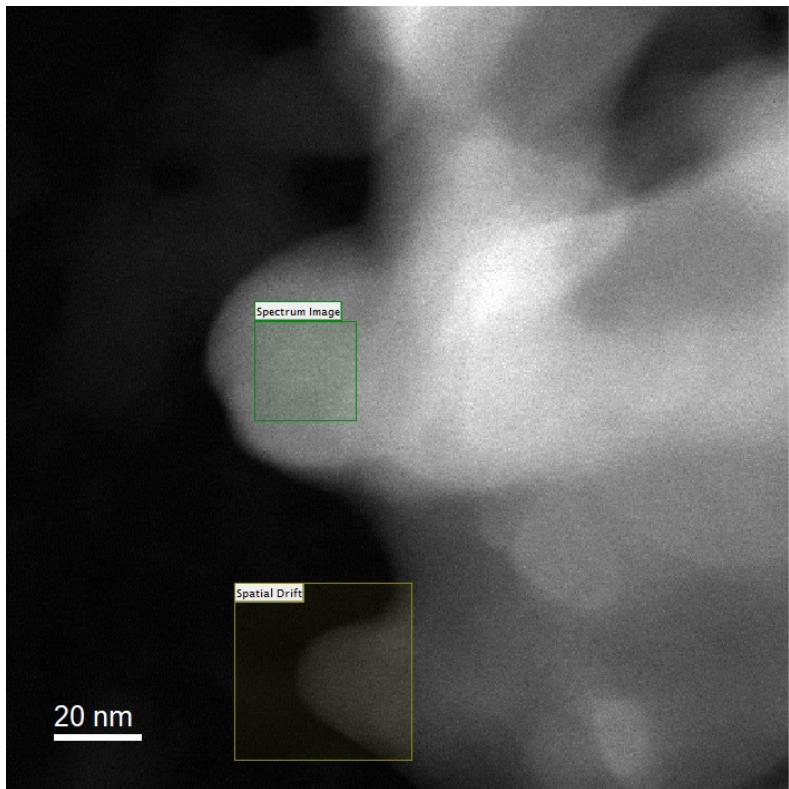
- Gaussian peak 1 (Plasmon peak):
  - Centered at 17.59eV
- Gaussian peak 2:
  - Centered at 55.28eV



## ADF – GeSe\_Accumulation\_ROI\_2\_POS\_2

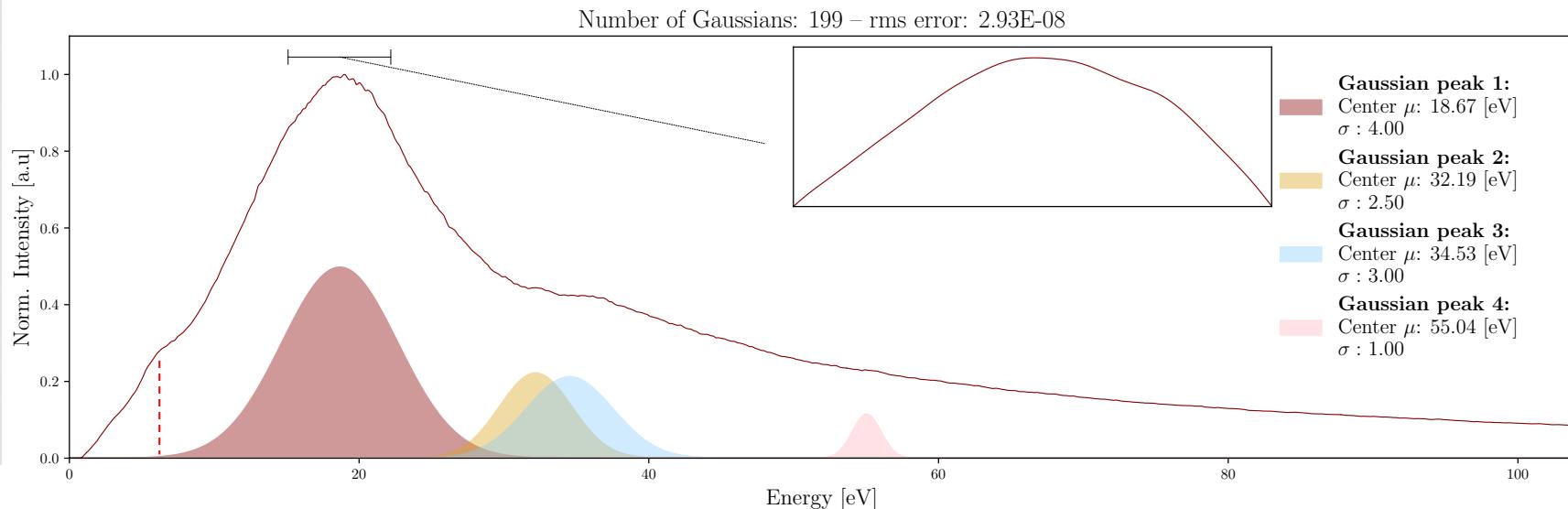


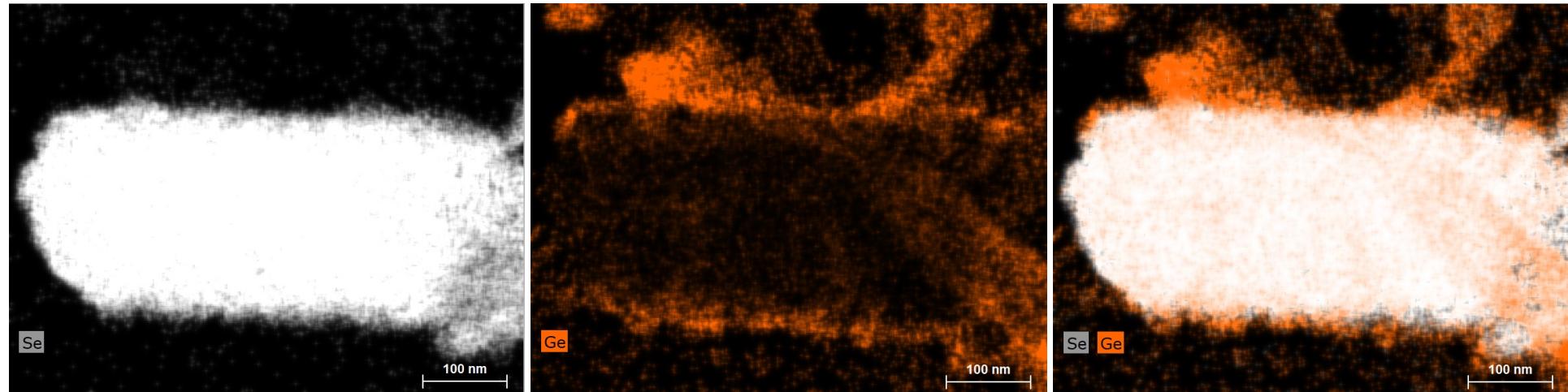
# High loss spectrum – GeSe\_Accumulation\_ROI\_2\_POS\_2



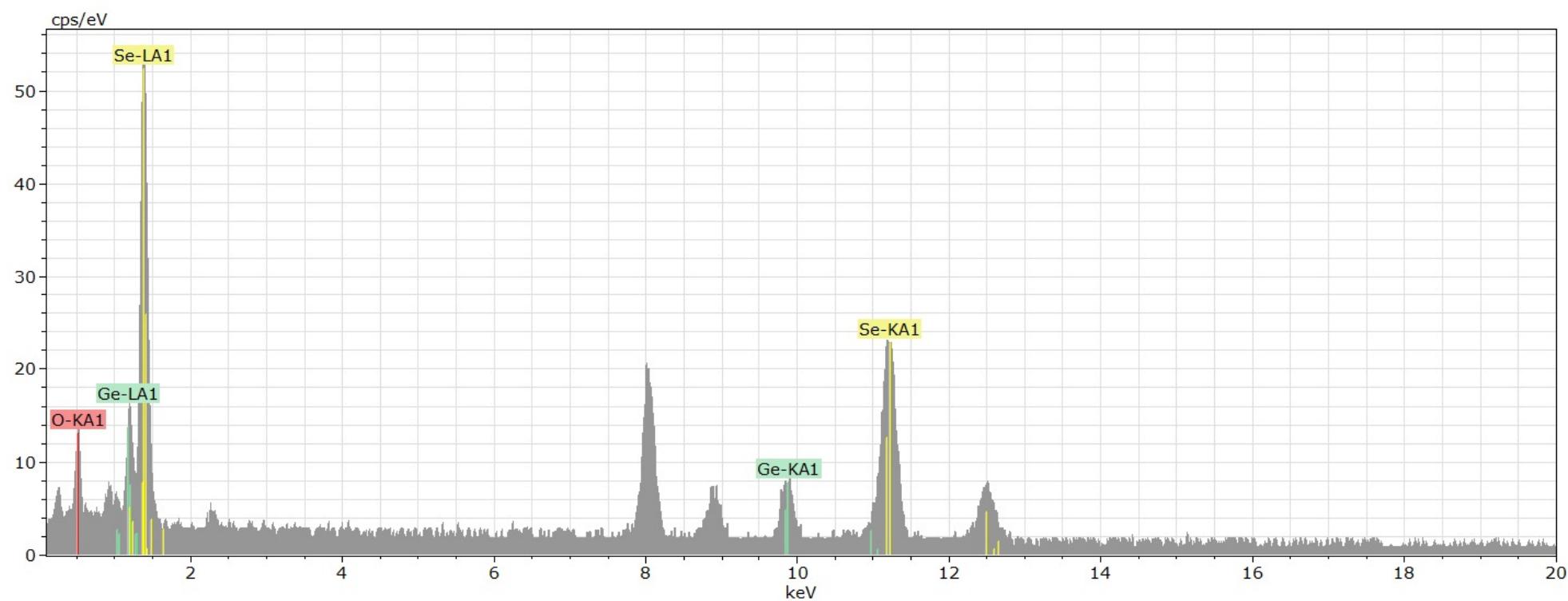
## Main peak features:

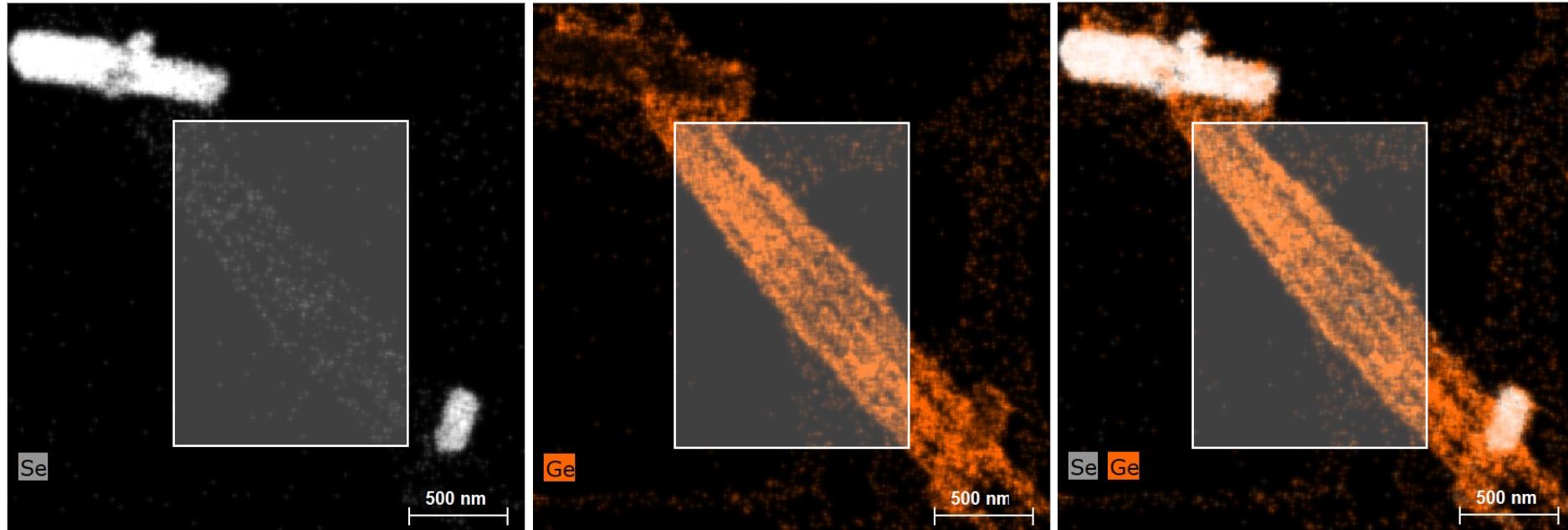
- Gaussian peak 1 (Plasmon peak):
  - Centered at 18.67eV
- Gaussian peak 3:
  - Centered at 34.53eV
- Gaussian peak 2:
  - Centered at 32.19eV
- Gaussian peak 4:
  - Centered at 55.04eV



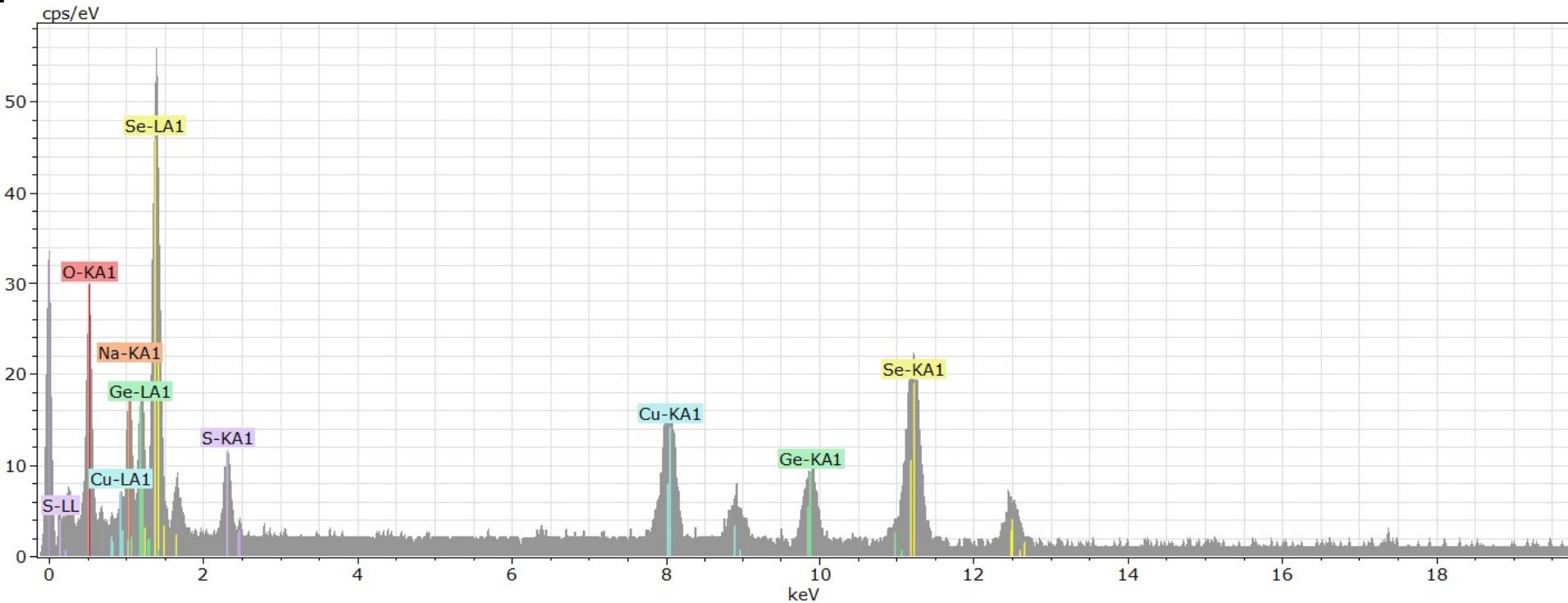


EDX map & spectrum  
of Needle\_ROI\_1

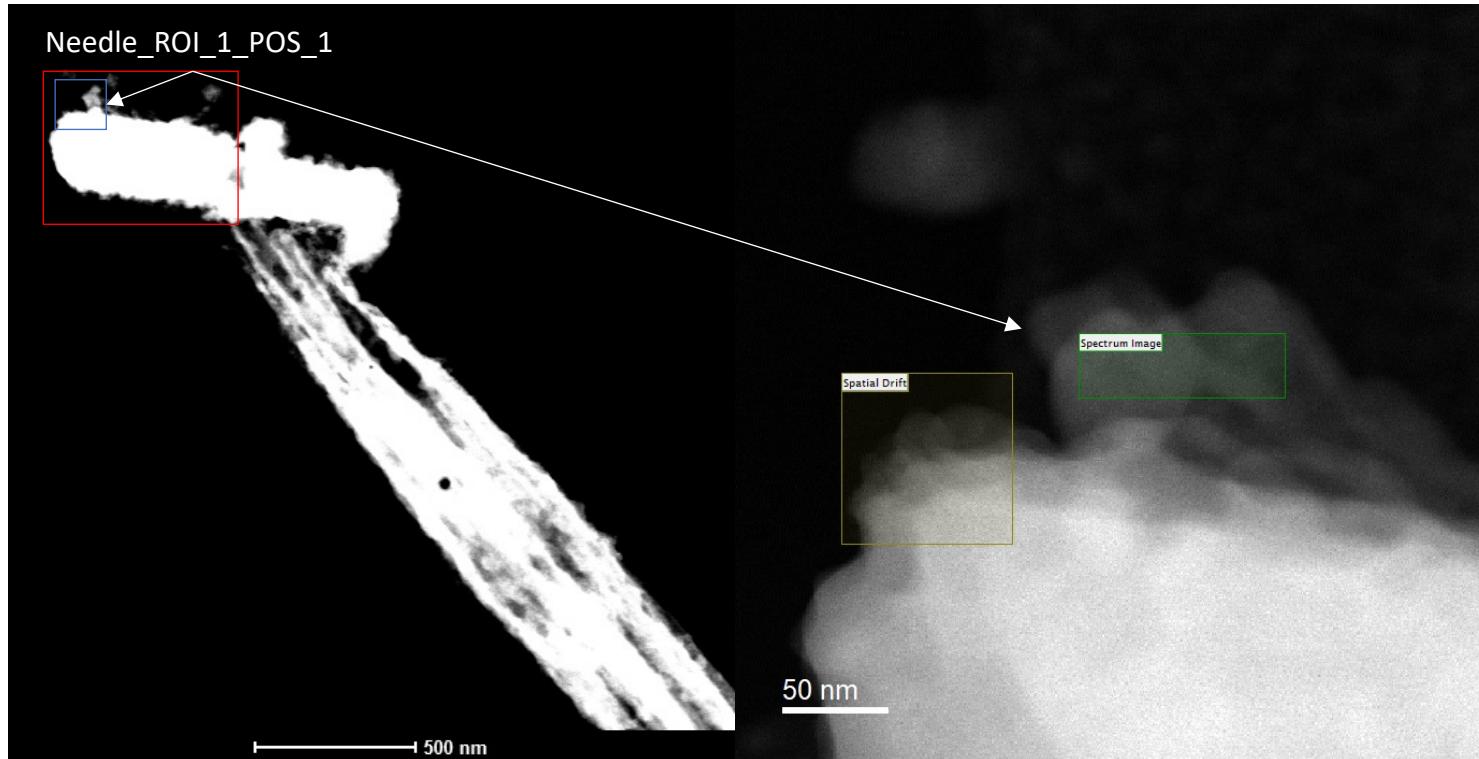




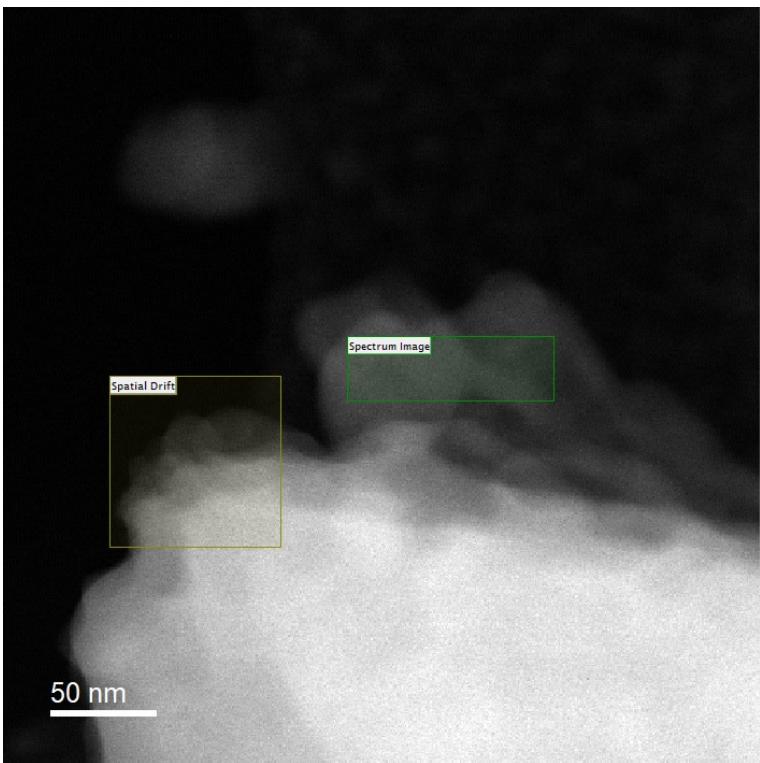
EDX map & spectrum of  
Needle\_ROI\_2



# ADF – GeSe\_Needle\_ROI\_1\_POS\_1

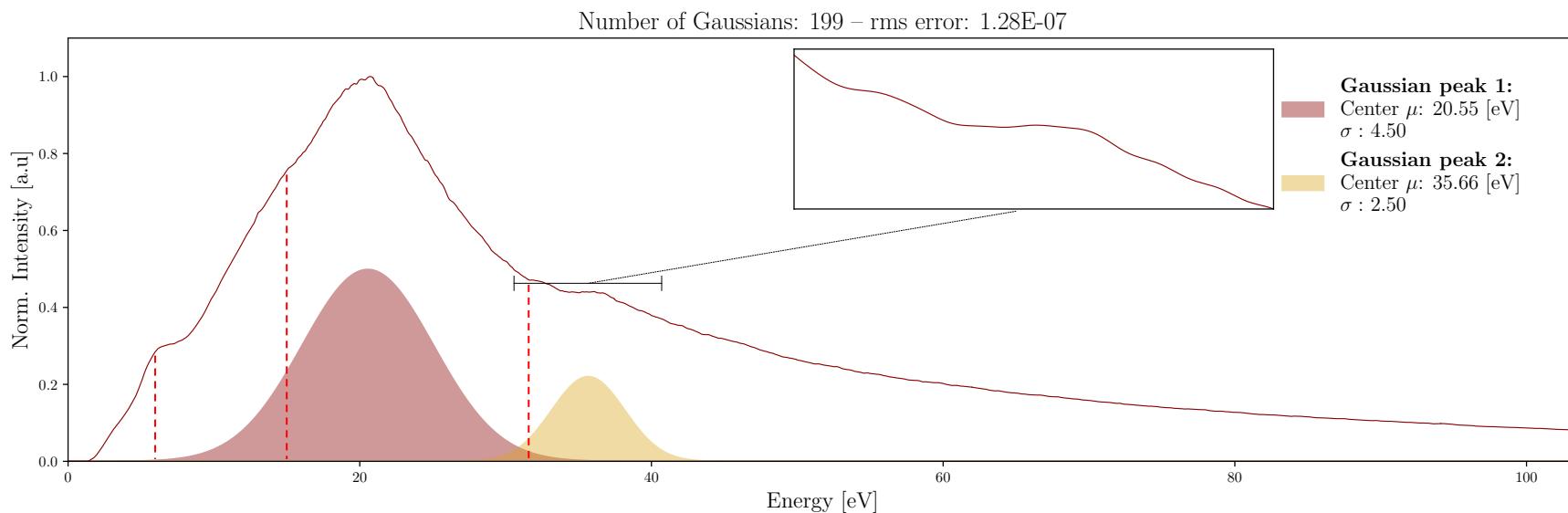


# High loss spectrum – GeSe\_Needle\_ROI\_1\_POS\_1

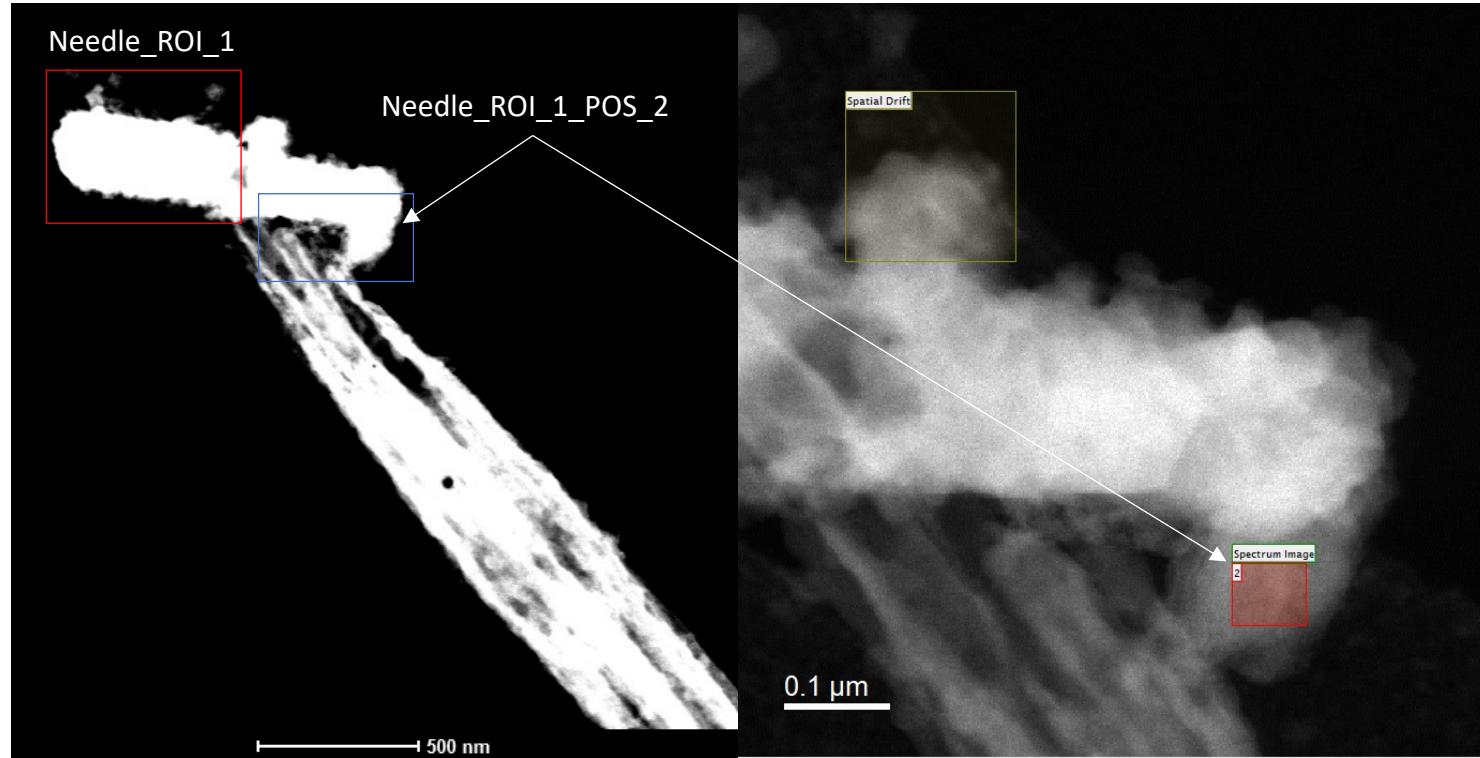


## Main peak features:

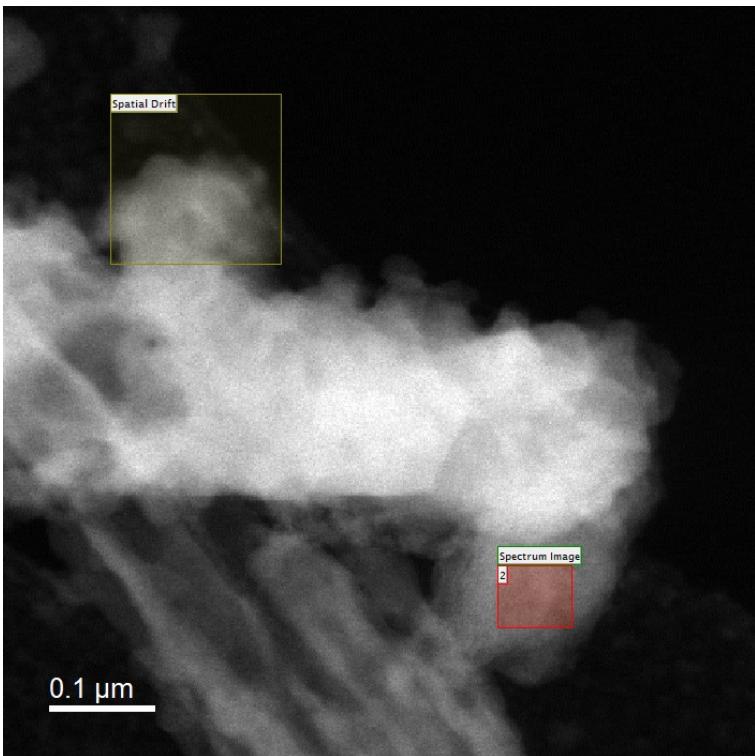
- Gaussian peak 1 (Plasmon peak):
  - Centered at 20.55eV
- Potentially many other peaks in hidden shoulders



## ADF – GeSe\_Needle\_ROI\_1 POS\_2

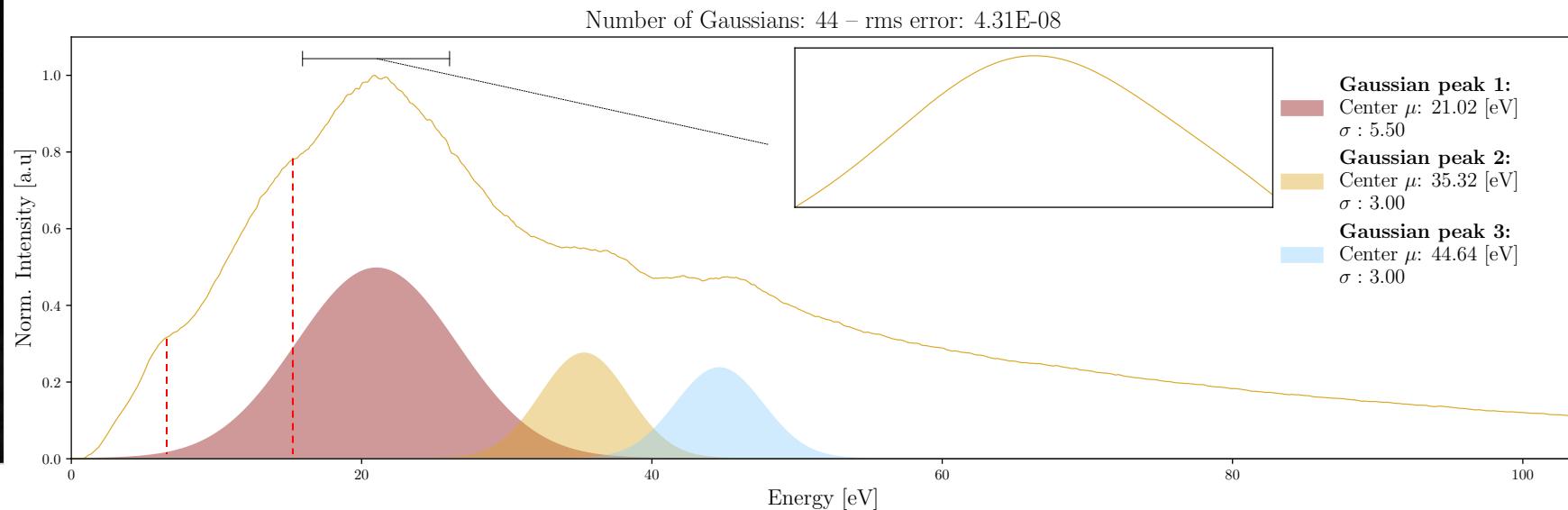


# High loss spectrum – GeSe\_Needle\_ROI\_1\_POS\_2

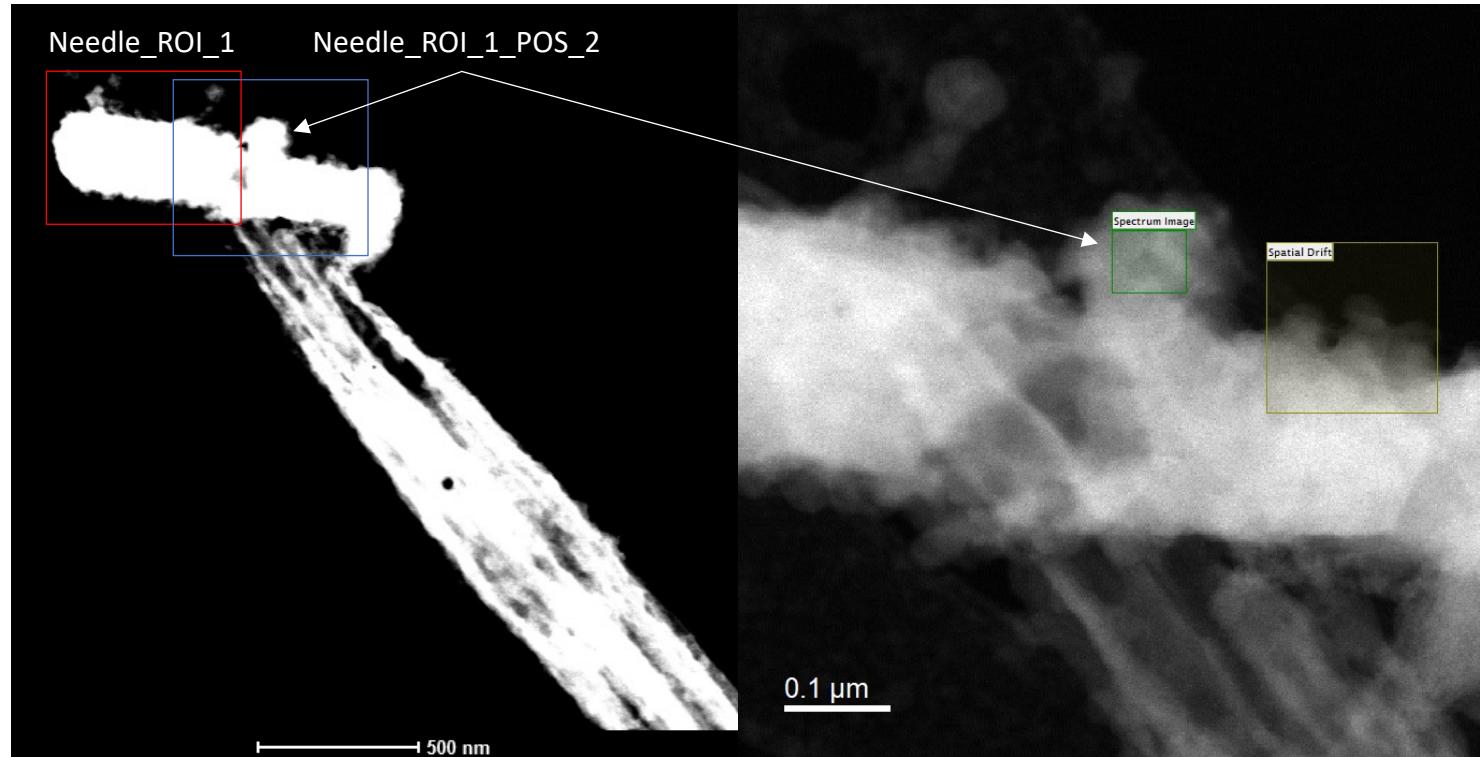


## Main peak features:

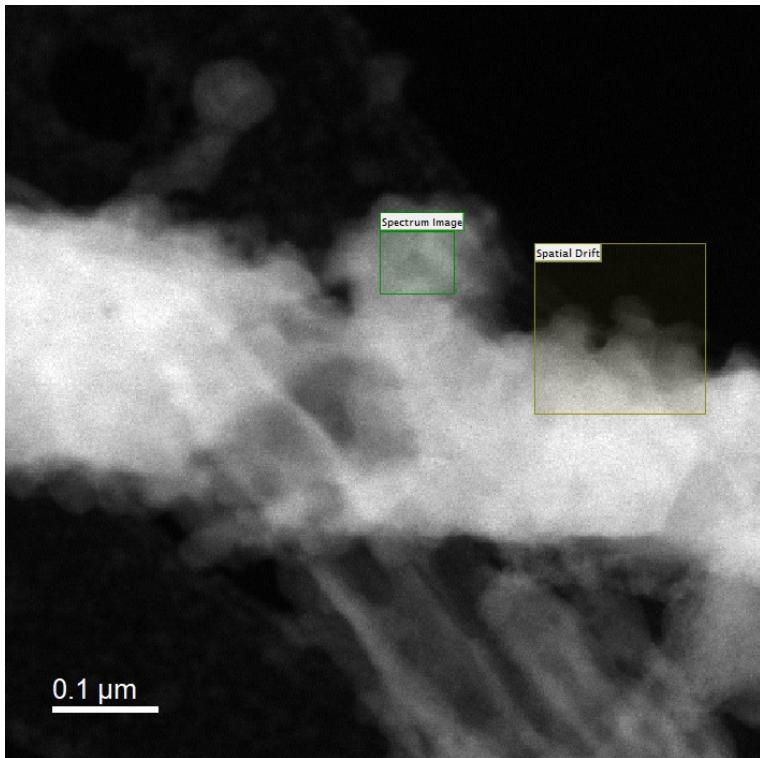
- Gaussian peak 1 (Plasmon peak):
  - Centered at 21.02eV
- Gaussian peak 3:
  - Centered at 44.57eV
- Gaussian peak 2:
  - Centered at 35.27eV



# ADF – GeSe\_Needle\_ROI\_1 POS\_3

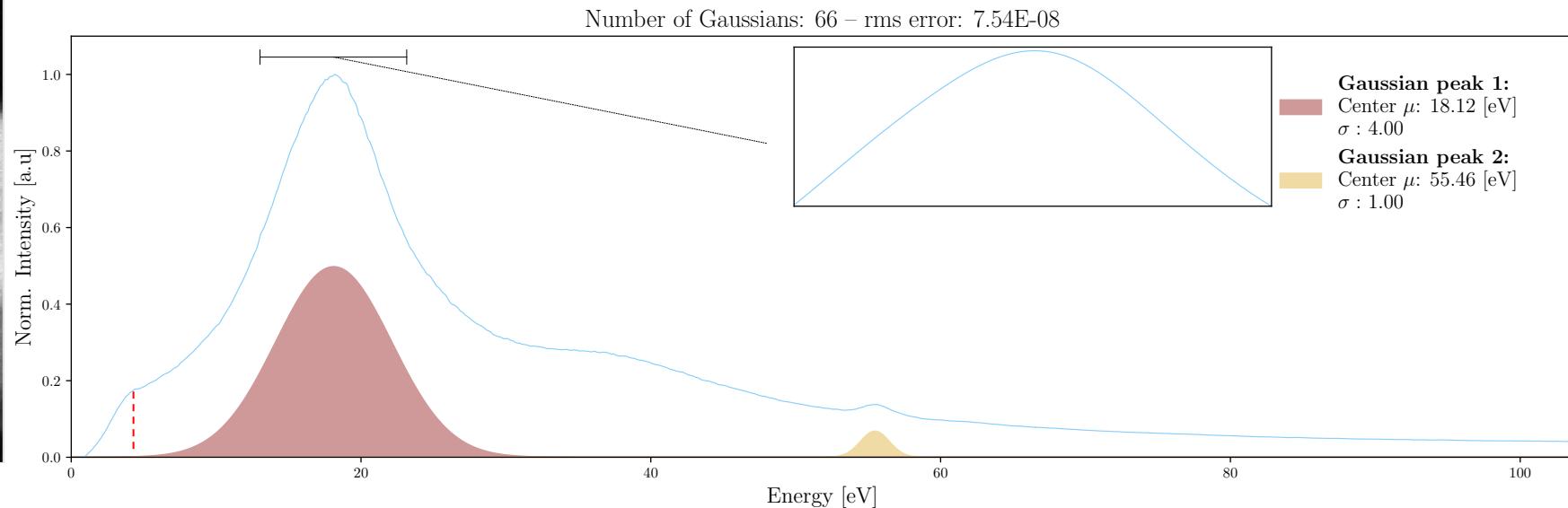


# High loss spectrum – GeSe\_Needle\_ROI\_1\_POS\_3

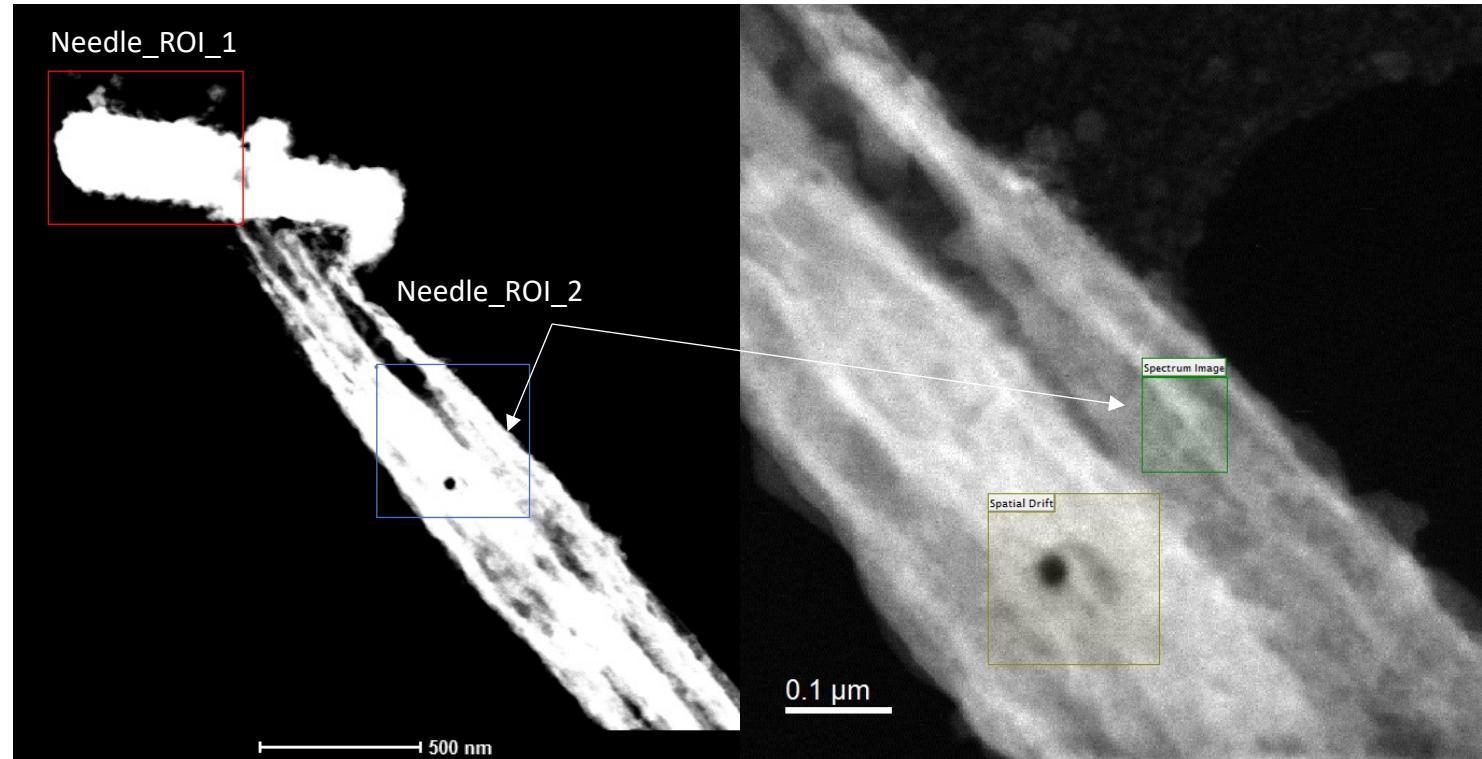


## Main peak features:

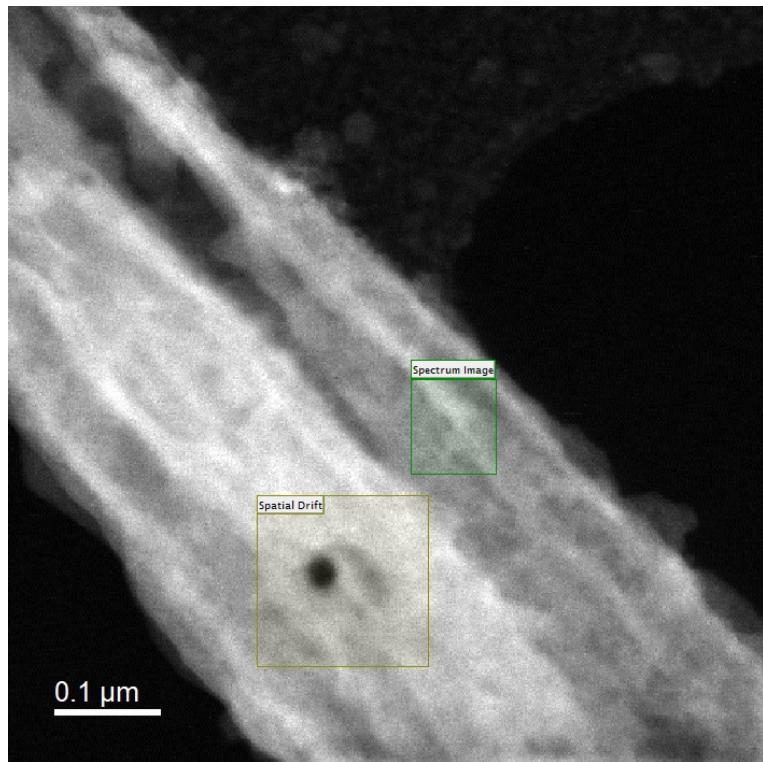
- Gaussian peak 1 (Plasmon peak):
  - Centered at 18.12eV
- Gaussian peak 2:
  - Centered at 55.46eV



## ADF – GeSe\_Needle\_ROI\_2



# High loss spectrum – GeSe\_Needle\_ROI\_2



## Main peak features:

- Gaussian peak 1:
  - Centered at 6.22eV
- Gaussian peak 3:
  - Centered at 17.14eV
- Gaussian peak 2 (Plasmon peak):
  - Centered at 14.18eV

