

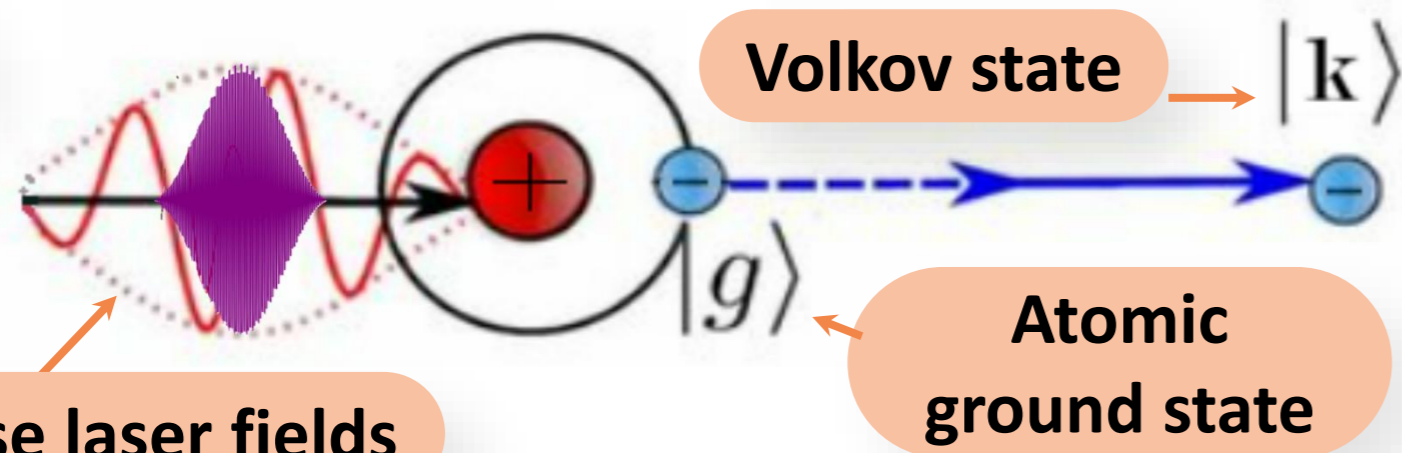
## Strong field photoionization: Analysis of overlapping ATI and LAPE structure

Migliaro Candelaria, Della Picca Renata  
Instituto Balseiro (Universidad de Cuyo), 8400 Bariloche, Argentina  
Centro Atómico Bariloche (CNEA), 8400 Bariloche, Argentina



### INTRODUCTION & METHOD

#### System



#### ATI: Above Threshold Ionization

Absorption of multiple IR photons, more than the energetically required

$$E_n = n\omega - I_P - U_P$$

#### LAPE: Laser Assisted Photo Emission

Ionization due to an XUV pulse followed by the absorption or emission of multiple IR photons

$$E_n = \omega_X \pm n\omega - I_P - U_P$$

### TRANSITION MATRICES

$$T_{if} = -i \int_{-\infty}^{\infty} \langle \chi_f^l(\vec{r}, t) | \vec{E} \cdot \vec{r} | \psi_{1s}(\vec{r}, t) e^{iI_P t} \rangle$$

Gordon-Volkov (SFA)

H(1s)

$$T_{if} = T_{if}^{XUV} + T_{if}^{IR}$$

LAPE

ATI

#### Emission Probability

$$\frac{dP}{d\vec{k}} = |T_{if}(\vec{k})|^2 = |T_{if}^{XUV}|^2 + |T_{if}^{IR}|^2 + 2 \operatorname{Re}(T_{if}^{XUV} T_{if}^{IR})$$

Incoherent sum

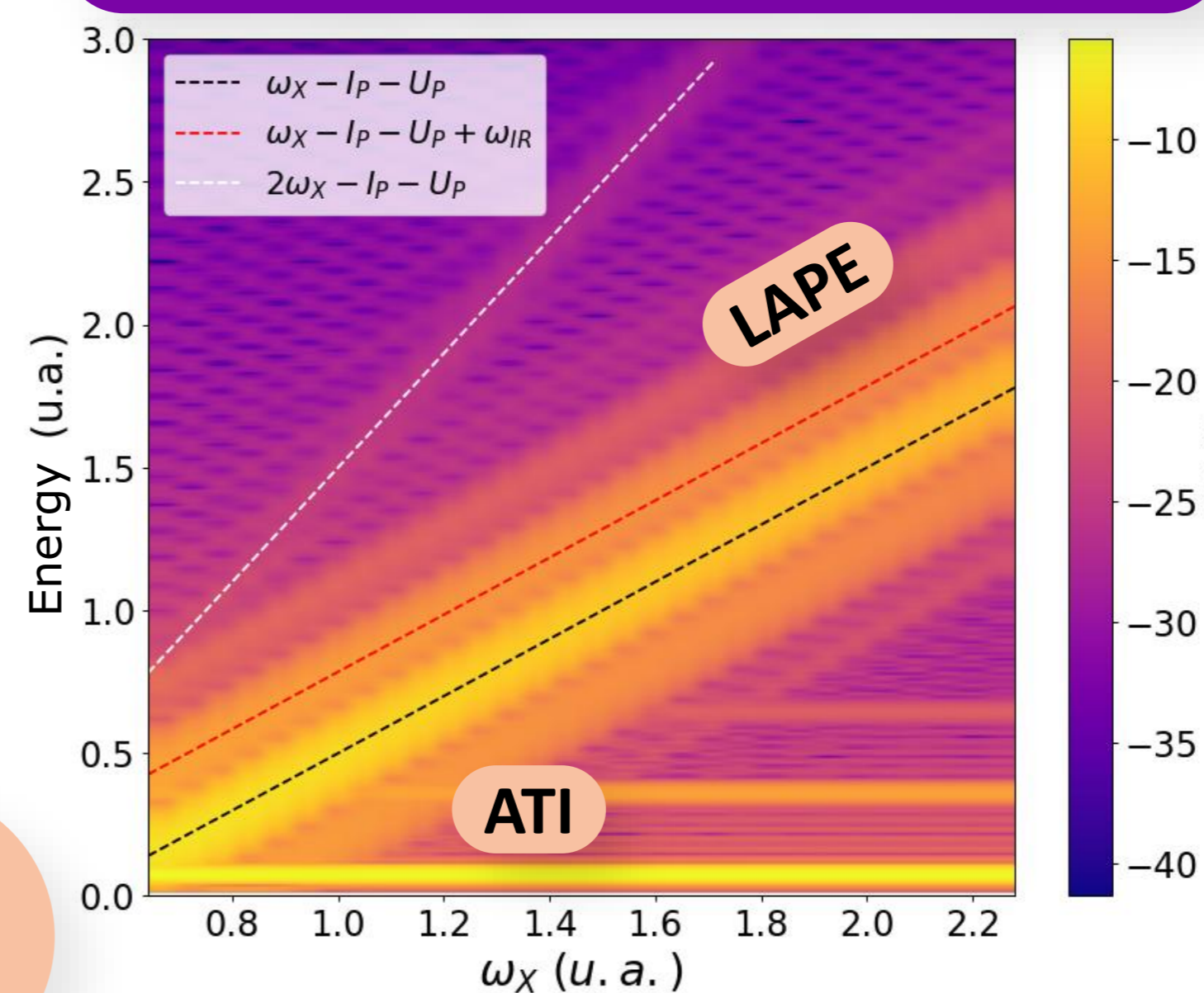
Coherent sum

$$\frac{dP}{dE}$$

Independent of the angle of emission

### RESULTS & DISCUSSION

#### Overlapping because of frequency



#### Laser parameters

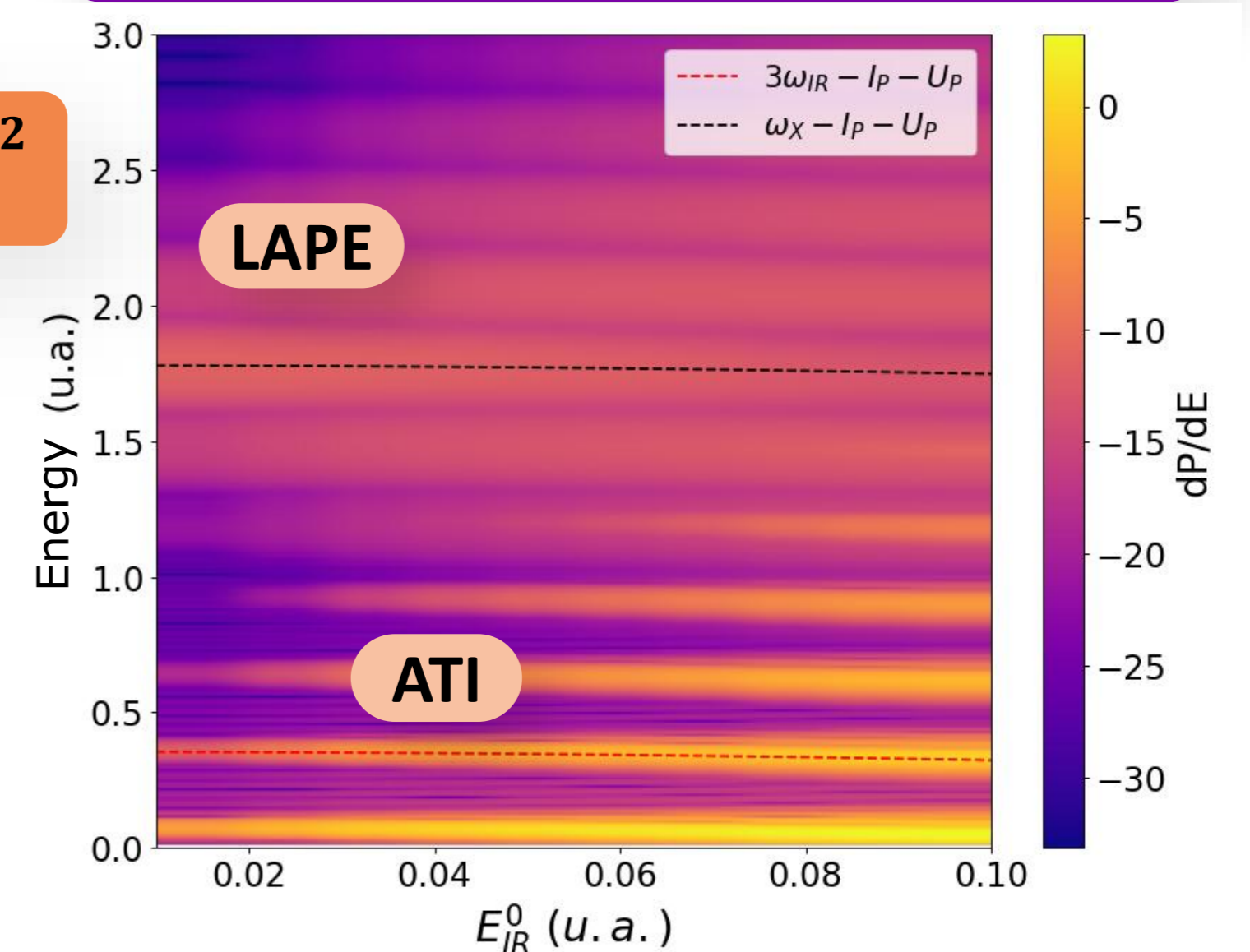
$$\begin{aligned} \omega_{IR} &= 2 \cdot 10^{15} \text{ Hz} \\ I_{IR} &= 3.5 \cdot 10^{12} \text{ W/cm}^2 \\ I_{XUV} &= 3.5 \cdot 10^{10} \text{ W/cm}^2 \end{aligned}$$

#### Laser durations

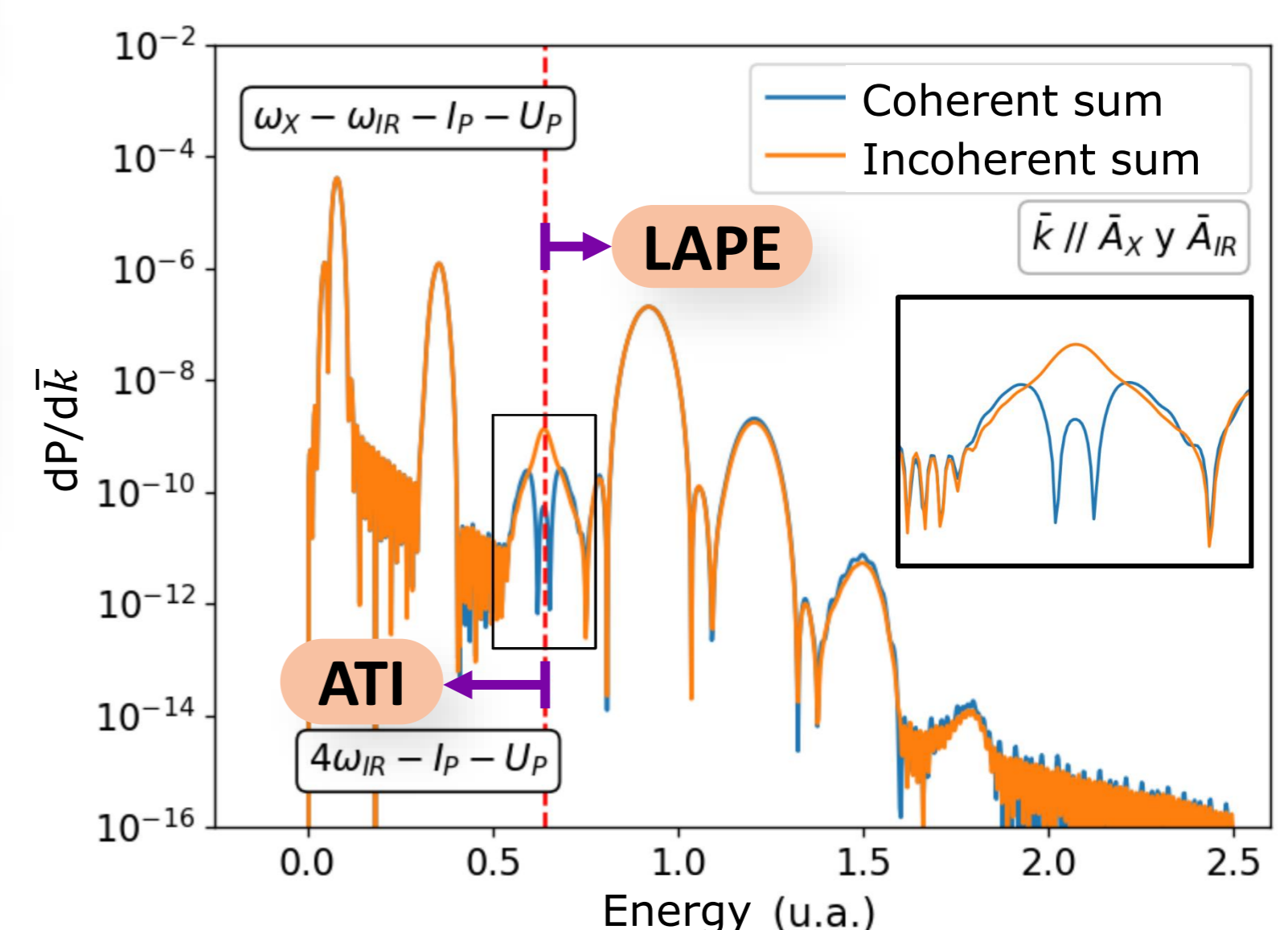
$$\begin{aligned} \tau_{IR} &= 67 \text{ fs} \\ \tau_{XUV} &= 10 \text{ fs} \end{aligned}$$

#### Overlapping because of intensity

$$I \propto (E_{IR}^0)^2$$



#### Possible interference



### CONCLUSIONS

- Depending on the laser parameters, ATI and LAPE structures could be superimposed or not.
- ATI and LAPE structures are clearly differentiated across the entire spectrum.
- Only at particular conditions an ATI-LAPE path-interference could be observed.