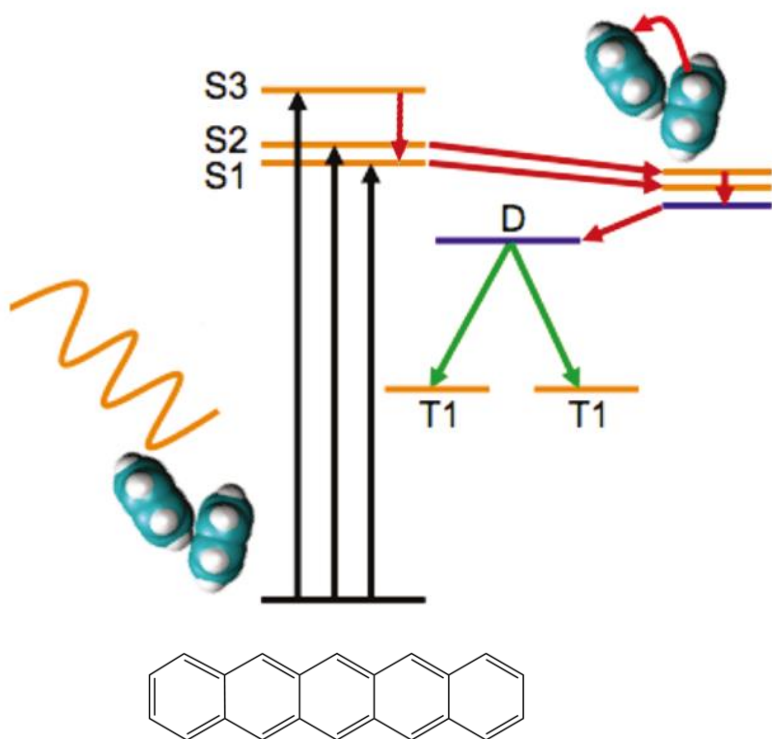


# Picosecond timescale tracking of pentacene triplet excitons with time-resolved X-ray spectroscopies

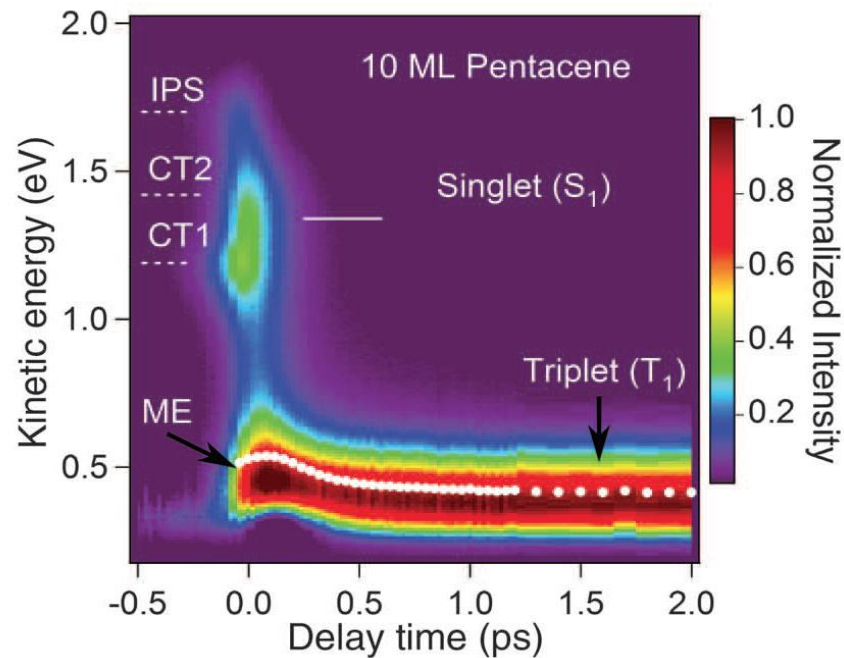
Roberto Costantini

# Basics of singlet fission

Zimmerman *et al.*, JACS (2011)

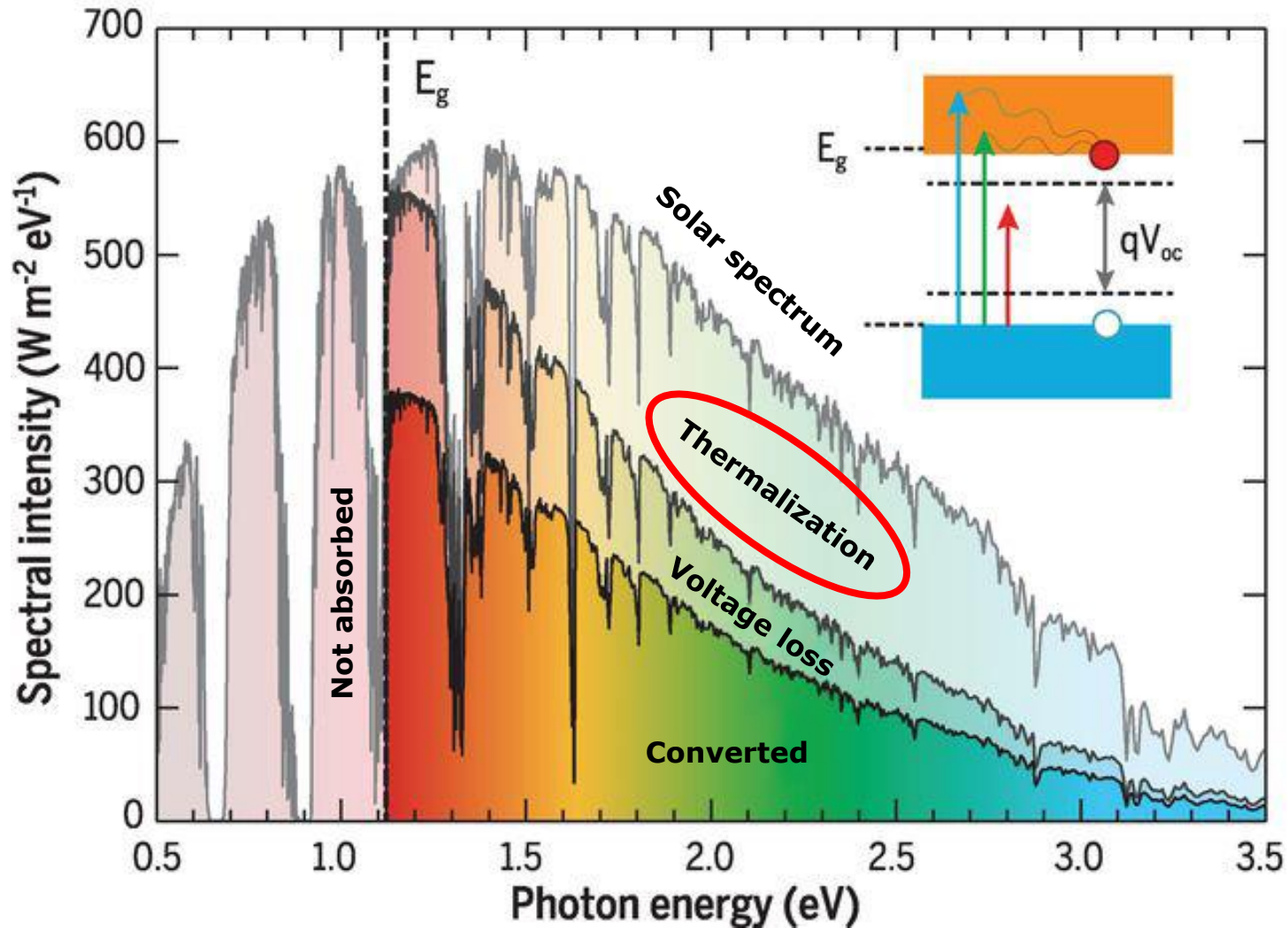


Chan *et al.*, Science (2011)

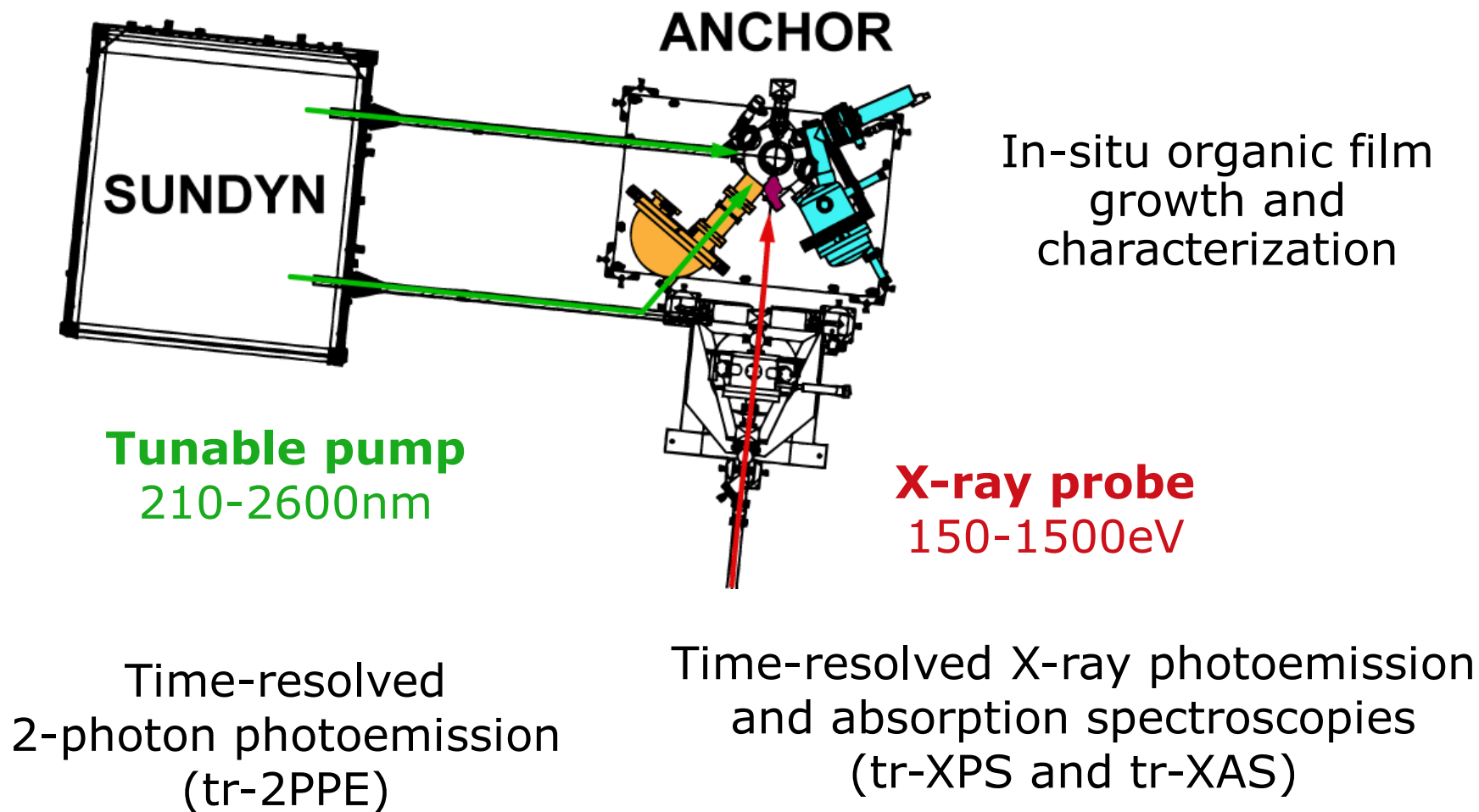


One photon → **two excitons**

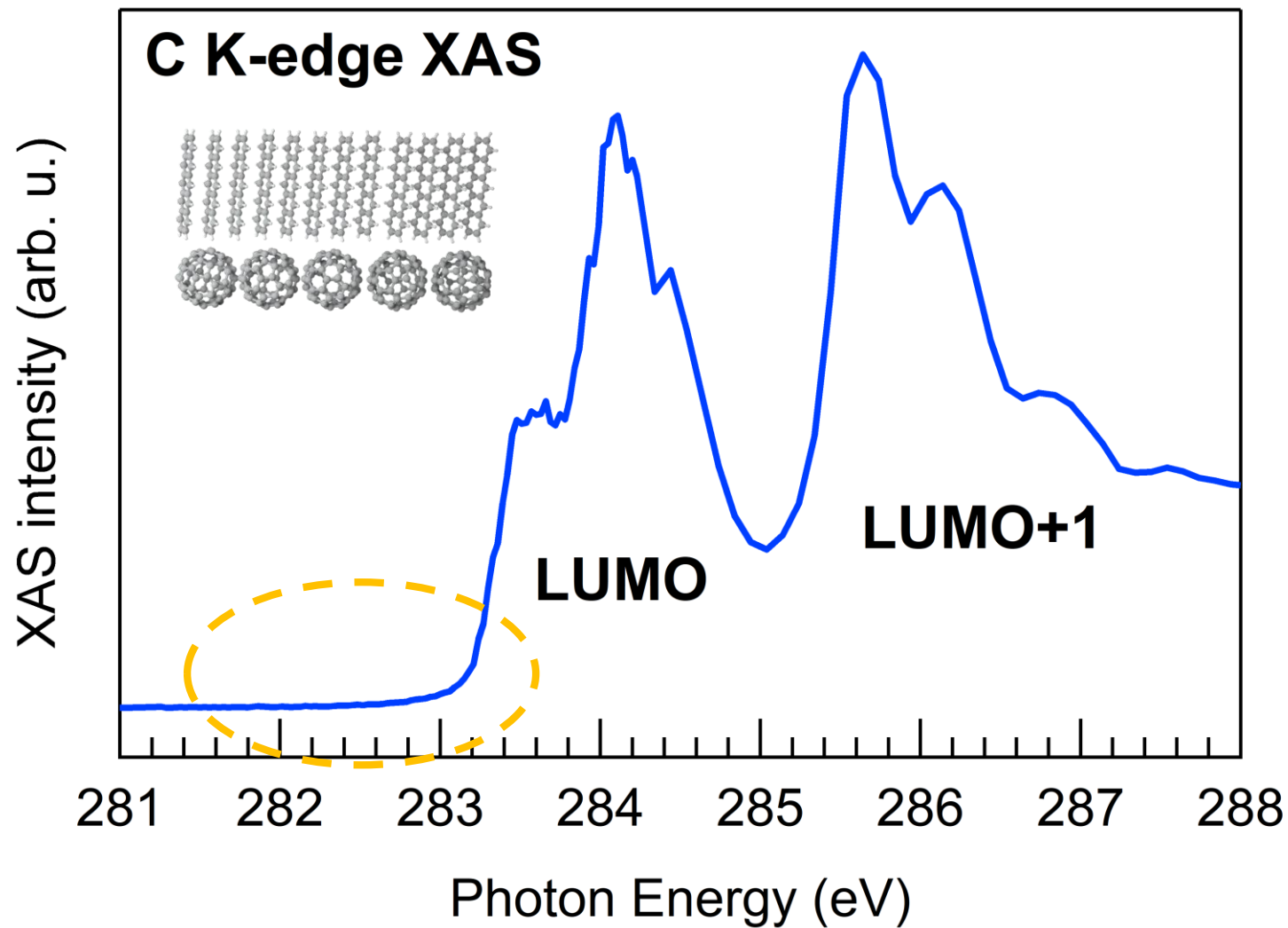
# Loss mechanisms in solar cells



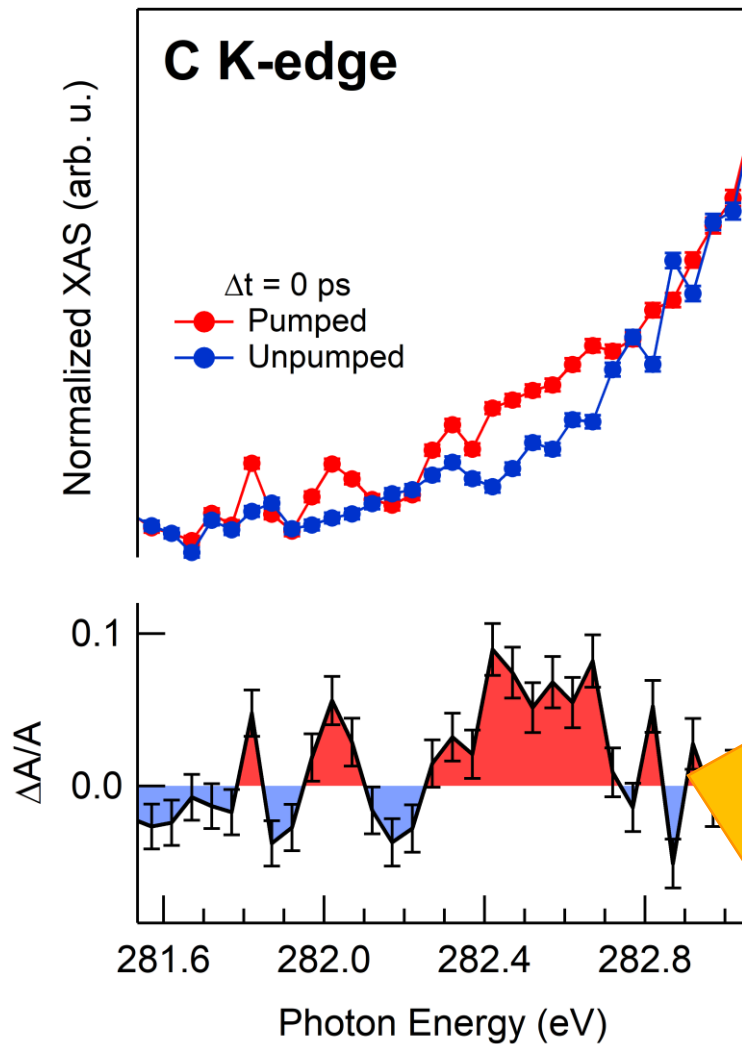
# Experimental endstation



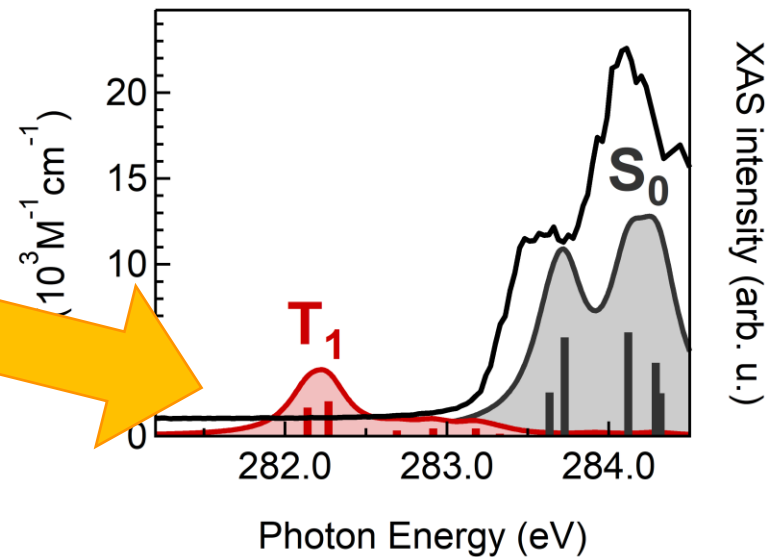
# XAS characterization



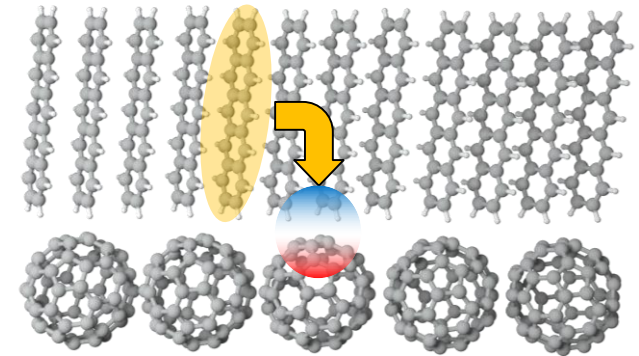
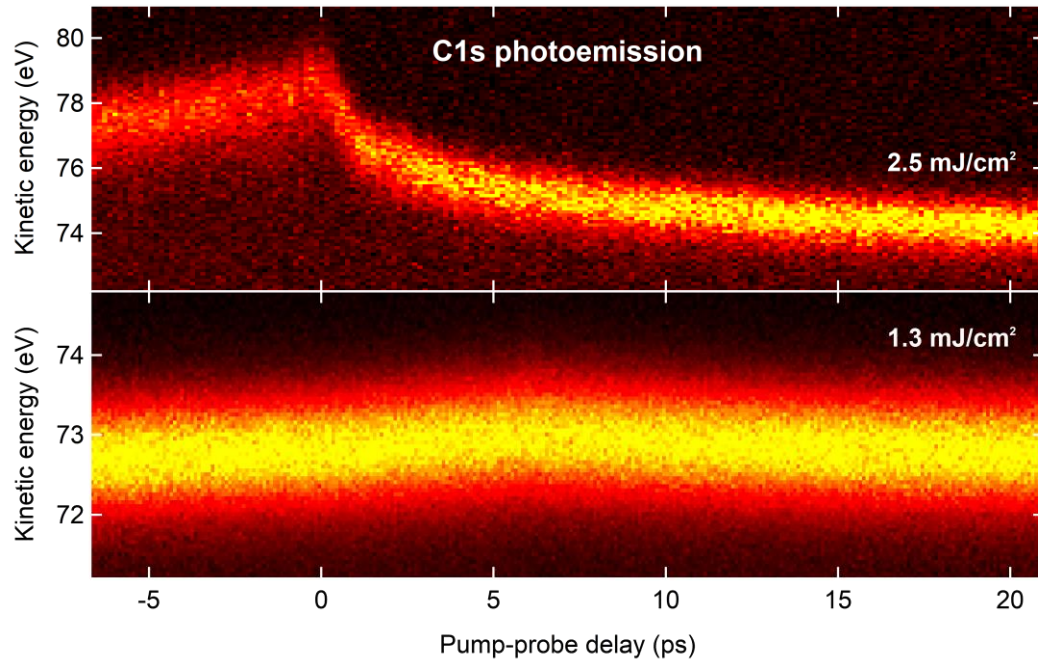
# tr-XAS: the triplet signature



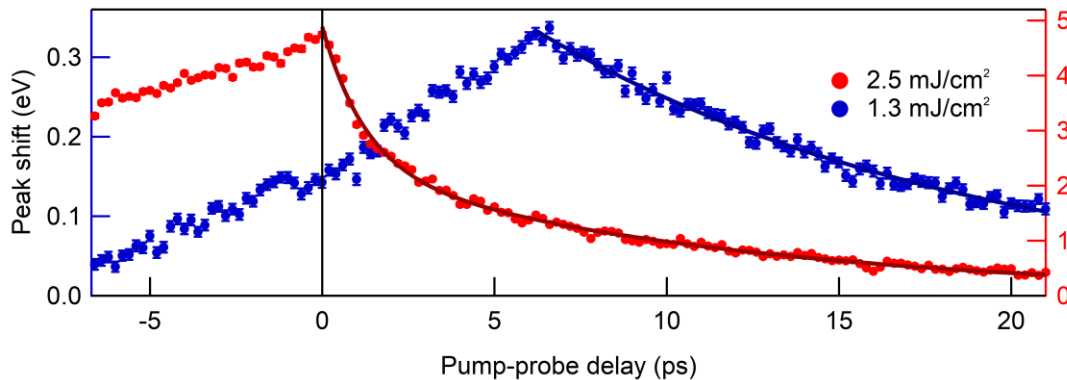
- Pump-induced feature rises at 282.5 eV
- Triplet fingerprint confirmed by theory



# tr-XPS at FLASH FEL: faster dynamics



6ps offset response

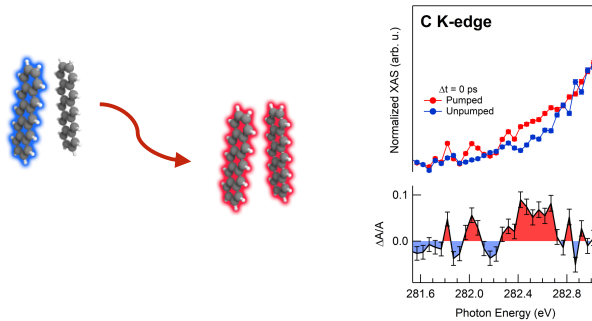


**Evidence of triplet transfer?**

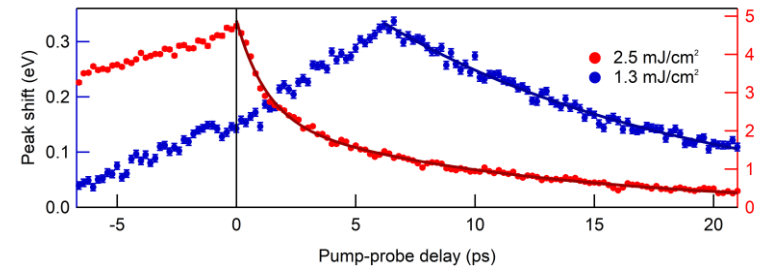


# Conclusions and outlook

Novel setup for time-resolved spectroscopies

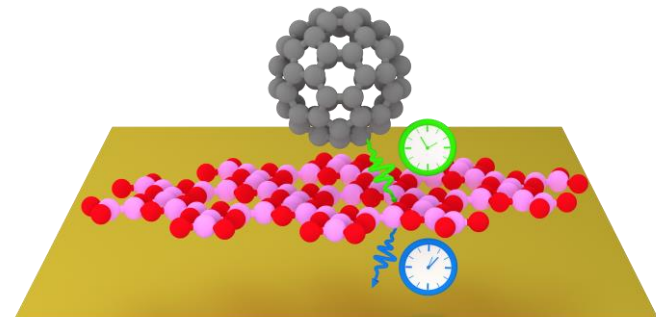


Pump-probe with  
**chemical selectivity**



Triplet exciton  
transfer?

Next step:  
complex D/A systems...





# Acknowledgements

SUNDYN-ANCHOR project:

Martina Dell'Angela, Albano Cossaro,  
Matus Stredansky, Cesare Grazioli,  
Alberto Morgante.



UNIVERSITÀ  
DEGLI STUDI DI TRIESTE

ALOISA beamline:

Alberto Verdini, Luca Floreano.



Theoretical calculations:

S. Coriani, R. Faber,

C. Hättig



Danmarks  
Tekniske  
Universitet

RUHR  
UNIVERSITÄT  
BOCHUM

RUB

FLASH staff:

L. Wenthaus, F. Pressacco,

S. Palutke, M. Scholz

G. Brenner, W. Würth



Funding: SIR grant SUNDYN (ref. RBSI14G7TL) of the Italian Ministry of Education Universities and Research (MIUR) and International project MIUR EUROFEL.

