## **European Conference on Trapped Ions (ECTI)**



Contribution ID: 193

Type: Invited Speaker

## Buffer gas cooling of trapped ions using ultracold atoms

Tuesday, 26 September 2023 11:15 (30 minutes)

I will discuss the ups and downs of buffer gas cooling of trapped ions in the ultracold regime [1-3]. I will focus on attainable temperatures, collision energies and possible issues such as spin exchange and relaxation during atom-ion collisions [4] as well as trap-assisted complexes that can arise after an atom-ion collision [5]. I will discuss the prospects of using the system to explore polaronic physics in an ultracold gas. Furthermore, I will present some results in quantum chemistry that we obtained some time ago when we immersed an ion into a cloud containing Li2 dimers [6,7]. These results are of interest when considering charged impurity physics in the BEC to BCS crossover regime in a fermionic spin mixture. Moreover, they highlight the possibilities offered to study quantum chemistry in the system.

[1] H. Hirzler et al., Phys. Rev. A 102, 033109 (2020).

[2] E. Trimby et al., New Journal of Physics 24, 035004 (2022).

[3] T. Feldker et al., Nature Physics 16, 413–416 (2020).

[4] H. Fürst et al., Phys. Rev. A 98, 012713 (2018).

[5] H. Hirlzer et al., Phys. Rev. Lett. 130, 143003 (2023).

[6] H. Hirzler et al., Phys. Rev. Research 2, 033232 (2020).

[7] H. Hirlzer et al., Phys. Rev. Lett. 128, 103401 (2022).

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