



Contribution ID: 33

Type: **Talk**

Stimulated deexcitation of antihydrogen atoms

Monday, 30 August 2021 12:00 (30 minutes)

Antihydrogen experiments hosted at CERN's Antiproton Decelerator rely on charge exchange [1] or three body recombination [2] formation mechanisms. In both cases, the anti-atoms are produced in a wide range of highly excited Rydberg states preventing the atoms' extraction through Stark acceleration or magnetic focusing into a field-free environment and consequently hindering spectroscopy or gravity measurements in a beam. I will discuss novel approaches to enhance the decay of the initially formed Rydberg levels toward the ground state. Mixing states either via crossed electric and magnetic fields [3] or impinging THz and/or microwave light [4] allows to efficiently employ deexcitation lasers and achieve close to unity ground state fractions in a few tens of microseconds which is compatible with experimental requirements. Results of a technology demonstration of cesium Rydberg state mixing with THz photomixing [5] will be discussed in the context of antihydrogen deexcitation. Finally, developments of a Rydberg hydrogen beam for a proof-of-principle experiment will be presented.

[1] Amsler, C., Antonello, M. et al. Pulsed production of antihydrogen, *Commun. Phys.* 4, 19 (2021)

[2] Kuroda, N., Ulmer, S., Murtagh, D. et al. A source of antihydrogen for in-flight hyperfine spectroscopy, *Nat Commun* 5, 3089 (2014)

[3] D. Comparat and C. Malbrunot. Stimulated decay and formation of antihydrogen atoms, *Phys. Rev. A* 99, 013418 (2019)

[4] T. Wolz, C. Malbrunot, M. Vieille-Grosjean, and D. Comparat. Stimulated decay and formation of antihydrogen atoms, *Phys. Rev. A* 101, 043412 (2020)

[5] M. Vieille-Grosjean, E. Dimova, Z. Mazzotta, D. Comparat, T. Wolz and C. Malbrunot. Induced THz transitions in Rydberg caesium atoms for application in antihydrogen experiments, *Eur. Phys. J. D* 75:27 (2021)

Is this abstract from experiment?

Yes

Name of experiment and experimental site

AEGIS and ASACUSA collaboration, CERN

Is the speaker for that presentation defined?

Yes

Details

Tim Wolz, CERN, Switzerland

Internet talk

Maybe

Primary author: WOLZ, Tim (CERN)

Co-authors: ASACUSA COLLABORATION, CERN; AEGIS COLLABORATION, CERN

Presenter: WOLZ, Tim (CERN)

Session Classification: Mini Workshop on Instruments and Methods in HEP