THz de-excitation of Rydberg atoms

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Many experiments at CERN like AEGIS aim to study antimatter behavior under gravity. For this purpose antihydrogen atoms are produced in a cryogenic cavity in Rydberg states. They have then to reach the ground state to have a lifetime long enough to measure gravity effects. The main problem of such experiment is that the spontaneous decay toward the ground state is too slow. We propose an experiment to study the possibility to achieve these transitions faster, using THz radiation [1][2]. For this purpose a sufficiently broad and continuous THz source shall be used in order to contain all the frequencies needed to stimulate the different transitions. The challenge we have to overcome is to drive the THz light into the vacuum chamber.

References

[1] I. I. Beterov, D. B. Tretyakov et al., *Ionization of Rydberg atoms by blackbody radiation, New journal of Physics* **11** (2009) 013052 (32pp)

[2] I. I. Beterov, I. I. Ryabtsev et al., *Quasiclassical calculations of BBR-induced depopulation rates and effective lifetimes of Rydberg nS, nP, and nD alkali-metal atoms with n<80.* arXiv:0810.0339v1