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Formation rate for Rb_2^+ molecular ions created in collisions of Rb Rydberg and ground-state atoms[1] JOVICA STANOJEVIC, ROBIN CÔTÉ, University of Connecticut — We calculate the formation rate of the molecular Rb_2^+ ion in its various bound states produced in the associative ionization of a Rydberg and a ground-state atom. Before the formation takes place, the colliding atoms are accelerated by an attractive force between the collision partners. In this way the ground-state atom is first captured by the Rydberg electron and then guided towards the positive ion-core where a molecular ion is subsequently formed. As recently demonstrated [1], this process results in giant collisional cross sections for the molecular ion formation, with the cross sections essentially determined by the size of the Rydberg atom. For sufficient high principal quantum numbers and atomic densities, many ground-state atoms are already located inside the Rydberg atom [2] and ready to participate in the associative ionization. The same process can occur between a Rydberg and a ground-state atom that form a long-range Rydberg molecule, possibly contributing to the shortening of the lifetimes of Rydberg atoms and molecules.

[1] T. Niederprüm et al., Phys. Rev. Lett. **115**, 013003 (2015).
[2] J. B. Balewski et al., Nature **502**, 664 (2013).

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