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Title: Driving Rotational Transitions in Molecules on a Chip
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Abstract: Polar molecules in selected quantum states can be guided, decelerated, and trapped using electric fields created by microstructured electrodes on a chip. Herein we explore how transitions between two of these quantum states can be induced while the molecules are on the chip. We use CO (a(3)Pi(1), v=0) molecules, prepared in the J=1 rotational level, and induce the J=2 <- J=1 rotational transition with narrow-band sub-THz (mm-wave) radiation. First, the mm-wave source is characterized using CO molecules in a freely propagating molecular beam, and both Rabi cycling and rapid adiabatic passage are examined. Then we demonstrate that the mm-wave radiation can be coupled to CO molecules that are less than 50 mu m above the chip. Finally, CO molecules are guided in the J=1 level to the center of the chip where they are pumped to the J=2 level, recaptured, and guided off the chip.