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# A Jumping Cylinder on an Incline

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The problem of a cylinder of mass  $m$  and radius  $r$ , with its center of mass out of the cylinder axis, rolling on an incline that makes an angle with respect to the horizontal is analyzed. The equation of motion is partially solved to obtain the site where the cylinder loses contact with the incline (jumps). Several simplifications are made: the analyzed system consists of an homogeneous disc with a one dimensional straight line of mass parallel to the disc axis at a distance  $y < r$  of the center of the cylinder. To compare our results with experimental data, we use a Styrofoam cylinder to which a long brass rod was imbedded parallel to the disc axis at a distance  $y < r$  from it, so the center of mass lies at a distance  $d$  from the center of the cylinder. Then the disc rolls without slipping on a long wooden ramp inclined at 15, 30 and 45 degrees with respect to the horizontal. To determine the jumping site, the motion was recorded with a high-speed video camera (Casio EX ZR100) at 200 and 480 frames per second. The experimental results agree well with the theoretical predictions.

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