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Wake field of an electron bunch moving parallel to a dielectric cylinder

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The wake field of an electron bunch moving parallel to the axis of a dielectric cylinder is being considered. It is shown that for a relativistic bunch ($\gamma \gg 1$) the circular harmonic of order zero contributes a decelerating force inversely proportional to γ, whereas the circular harmonics of nonzero order contribute a γ-independent force. Moreover, the wake linked to the circular harmonic of order zero may grow in space in case the dielectric cylinder consists of an active medium; however, this growth rate does not depend on the value of γ. On the other hand, no growth is anticipated for the case of circular harmonics of nonzero order.

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