



Abstract

Interactive Applications to Teach the Einstein's Energy-Momentum-Mass Relation in the Secondary School †

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Abstract: Two Geogebra-based interactive applications to teach the Special Relativity Energy-Mass-Momentum relation are presented. They are useful tools to visualise the mathematical relation from a geometrical perspective, thus helping students facing calculus difficulties to understand the beauty of this equation. Both give students the opportunity to carry out explorations and come to conclusions. Students are asked to inquire the meaning of the p/E ratio for particles with different masses and energies, to discover that a system with a given finite mass and increasing energy travels at a speed approaching a finite value. Even the relativistic meaning of the mass of a system two particles can be addressed. Students can discover that the relativistic mass is different from the mere sum of the masses of the system, is always greater than or equal to the sum of the masses, depends on the momenta directions and is equal to the sum of the masses if all the particles of the system are at rest. As these concepts are crucial for the understanding of how particles are discovered in Particle Physics, the two applications open the way to introduce students to the main aspects of modern research in Nuclear and Accelerators Physics.

Keywords: mass; invariant; energy; momentum; special relativity; Einstein



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