International Journal of Theoretical Physics, Vol. 34, No. 3, 1995

On the Theory of High-Velocity Particles: A Comment

I. J. Good[1]

Received September 15, 1994

An argument claiming to prove two familiar consequences of special relativity, starting from the wave–particle duality of L. de Broglie, is found to be circular.

Gordeyev (1979) argued that the formulas

$$E = mc_0^2 \tag{1}$$

and

$$m = \frac{m_0}{(1 - v^2/c_0^2)^{1/2}} \tag{2}$$

(where E is the energy of a particle, c_0 is the speed of light in a vacuum in a "privileged" reference system, m is the mass of the particle, m_0 is its rest-mass, and v is its speed) can be derived "without making assumptions on the transformational properties of space-time." He further assumed L. de Broglie's wave–particle duality, and postulated that

$$v_g v_f = c_0^2 \tag{3}$$

where v_g and v_f denote group and phase velocities.

But formula (2) was part of the basis for de Broglie's theory. For a convenient and brief discussion of the history, with references, see Whittaker (1953, pp. 214–215), where it is mentioned that (3) is also a necessary consequence of relativity theory.

[1]Department of Statistics, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061-0439.

0020-7748/95/0300-0453$07.50/0

It is hardly surprising that, by implicitly beginning with assumptions that derive from relativity theory, or from the Lorentz transformation, one can arrive at those assumptions again in explicit form.

In the remainder of his paper, Gordeyev, while accepting the self-consistency of special relativity, claims that a theory involving absolute space (à la Lorentz?) could give the same known experimental consequences as the special theory. "Michelson–Morley" experiments, done at various seasons, should have more or less settled the matter against the theory of absolute space.

REFERENCES

Gordeyev, G. V. (1979). *International Journal of Theoretical Physics*, **18**, 397–409.

Whittaker, Edmund (1953). *History of the Theories of Aether and Electricity, 1900–1926*, Thomas Nelson, London.