

International Conference and Exhibition on **Mesoscopic & Condensed Matter Physics**

June 22-24, 2015 Boston, USA

Is $E=\Delta mc^2$ is mathematically derived or speculated in Sep.1905 paper?

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In this paper, Einstein derived $\Delta L=\Delta mc^2$ (light energy –mass equation), it is not completely studied; and is only valid under special conditions of involved parameters, e.g. number of light waves, magnitude of light energy, angles at which waves are emitted and relative velocity v . Einstein considered just two light waves of equal energy, emitted in opposite directions and velocity v is uniform. There are numerous possibilities of parameters which are not considered in Einstein's derivation. $\Delta E=\Delta mc^2$ is obtained from $\Delta L=\Delta mc^2$ by simply replacing L by E (every energy) without derivation. Fadner pointed out that Einstein neither mentioned E or $\Delta E=\Delta mc^2$, in the derivation which is absolutely correct. Here results are critically analyzed taking all possible variables into account. Under some conditions of valid parameters $\Delta L=\Delta mc^2$ is not obtained, e.g. sometimes result is $Ma=Mb$ or no equation is derivable. If all values of valid parameters are taken into account, then the same derivation also gives $L \propto \Delta mc^2$ or $L=A \Delta mc^2$, where A is the coefficient of proportionality. Thus Einstein's derivation under the valid parameters also predicts that energy emitted may be less or more than $\Delta L=\Delta mc^2$.

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Interacting Bose gas in a harmonic trap

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We devote a particular attention to the role played by the repulsive interaction in order to determine a various quantities of the Bose gas in a harmonic trap, for example the chemical potential of condensed atoms, the chemical potential of non-condensed atoms, the anomalous fraction and the heat specific capacity at finite temperature as function as the number of atoms. We also calculate their behavior in Thomas Fermi approximation, where the thermal cloud is not negligible. We compare our results with literature and experience, we find a good agreement.

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Magneto-optical interactions: Linear and non linear photonic hall effects

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The colloidal dispersion of nano-sized, surfactant coated ferrite particles exhibit stability against magnetic coagulation and subsequent gravitational sedimentation due to elastic repulsion between organic surfactant molecules. Such magnetic fluid was taken in a, thin width, transparent sample holder and subjected to unpolarized Laser beam. Transmitted intensity was recorded as a function of magnetic field applied tangentially. Study of birefringence showed beam intensity in perpendicular direction also; a Photonic Hall Effect. Transition between linear and non-linear optical effect was observed and experimental results were explained by developing suitable theoretical model.

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