MUN PHYSICS

Department of Physics and Physical Oceanography &
CAP Undergraduate Lecture Tour 2013
present

The Canadian Association of Physicists

Could the hadron be the hologram of a vibrating string in a fifth dimension?

Undergraduate Lecture: Thursday, March 7, 2013
3:30pm room C2045

Dr. Ruben Sandapen

Département de Physique et
d'Astronomie
Université de Moncton

http://professeur.umoncton.ca/
umcm-sandapen_ruben/

A hundred years ago, Niels Bohr published a revolutionary model of the hydrogen atom that successfully predicts the spectrum observed when hydrogen gas emits light. Bohr's model paved the way for the quantum mechanical picture of the atom which allows us to compute accurately the physical properties of the atom.

Our current understanding of the hadron is much less satisfactory than that of the atom. A hadron is a bound state of quarks glued together by the strong force. A familiar hadron is the proton made up of three quarks. Unlike the electric force, the strong force has the strange property of becoming more intense as the distance between the quarks increases. Thus, while one can easily extract an electron from an atom, it is impossible to isolate a quark from a hadron. The quarks in a hadron interact strongly with each other by exchanging gluons and these gluons interact amongst themselves by exchanging other gluons. Thus the hadron is a rather complicated system of strongly interacting quarks and gluons.

We shall here explore a novel idea: what we observe as a hadron in physical spacetime, i.e. a complicated system of strongly interacting quarks and gluons could be the hologram of a much simpler system, namely a vibrating string in the fifth dimension of a curved spacetime. Interestingly, recent experimental data seem to favour such a picture.

Senior undergrads are encouraged to attend a pizza lunch with speaker 12pm, C2039