

IQSE AMO QO Seminar Series

**Tuesday, January 25th, 11:30 am ZOOM & IQSE
seminar room (MPHY 578)**

Pizza will be served for IQSE members at 11:00 am. The talk will start around 11:30 am

Dr. Jonathan S. Ben-Benjamin

IQSE, Texas A&M University

A quantum optics view of Hawking's Hawking radiation cartoon

EVENT DETAILS: In 1975, Hawking published his celebrated paper [1] "Particle Creation by Black Holes," where it has been suggested for the first time that black holes could decrease in mass by emitting particles; whereas until that time, it was held that the mass of black holes could never decrease (which is proven using classical physics [2,3]). The following year, he published an article in Scientific American where he discusses the result in a completely different way; in terms of a creation of a pair of particles, one of which devoured by a black hole, the other surviving to tell the tale. This view of Hawking radiation -- as it has come to be known -- has captured the public, and has become a standard way to discuss the proposed phenomenon. What is not well-known is that this view of Hawking radiation has no basis in mathematics; indeed some would even call it "pseudo-science," and here I dub it "cartoon." Because of its elegance, however, we asked if it could be shown to be a reasonable view. I will present a slightly different view that is somewhat analogous to Hawking's cartoon, using a two-level atom which is held at a constant distance outside a black hole, and show that it has similarities.

J. S. Ben-Benjamin is a Post-doctoral fellow at the Institute for Quantum Science and Engineering (IQSE) at Texas A&M University, under the directorship of Prof. Marlan Scully. He did his PhD work under Prof. Leon Cohen on noise and phase-space quantum mechanics, and now works on quantum optics and QFT in curved spacetime.

[1] S. W. Hawking, "Particle Creation by Black Holes," Comm. Math. Phys. 43 199-220 (1975).

[2] S. W. Hawking, "The event horizon," in "Black holes" Ed. C. M. DeWitt, B. S. DeWitt, New York, Gordon and Breach (1973).

[3] S. W. Hawking, Comm. Math. Phys. 25 235-166 (1972).

[4] S. W. Hawking, "The Quantum Mechanics of Black Holes," Sci. Am. 34 (1976).

ZOOM information:

<https://tamu.zoom.us/j/98156251523?pwd=QVdSdGxtL1UyY0g1L083SU5QR0QrUT09>

Meeting ID: 981 5625 1523

Passcode: 297578

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