

Physics Colloquium

Michigan Technological University

Thursday, October 22, 2009

4:00 pm

Room 139, Fisher Hall



Towards achieving event horizons in non linear optical resonators.

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Abstract: Superluminally moving and/or non-uniformly accelerated mirrors or dielectric are expected to emit *quantum vacuum radiation* by the conversion of the zeropoint quantum fluctuations of the electromagnetic field into real, observable photons. This phenomenon shares deep analogies with Hawking radiation from gravitational black holes. Although the experimental detection of this radiation is extremely interesting from a fundamental point of view, the weakness of its intensity has so far prevented its experimental observation.

Here I explore an approach based on light refraction and reflection across moving interfaces created by an optical nonlinearity in a static optical waveguide. There is no physical motion of dielectrics, thus large speed and acceleration of the interfaces can be in principle achieved. Such devices might lead to experimental observation of Unruh radiation [1].

Refraction and reflection in this kind of devices are expected to show interesting quantitative differences from Doppler shift in rigidly moving dielectric media [2]. Potential applications can be envisioned for telecommunications [3].

I also show preliminary experimental results on steady-state coupling of pulsed light to a LiNbO_3 optical microcavity. The optical nonlinearity of the resonator can be excited by contactless RF waves [4].

Biography: Zeno Gaburro, completed his undergraduate studies in electrical engineering *summa cum laude* at Politecnico di Milano in 1992, and received his Ph.D. in electrical engineering from the University of Illinois at Chicago in 1998. After a research internship at Argonne National Laboratory in 1997, he has been employed as Process Characterization Engineer at Austria MikroSysteme, a European ASIC/VLSI company, in 1998-99. In 1999 he joined the Physics Department of the University of Trento, Italy, in his current position.

He served as a referee for AIP, IOP, OSA and SPIE journals, and as reviewer of research projects in Physics for the Ministry of Research and Education of Finland in 2008 and 2009. Since 2002 he has chaired symposia on nanostructured photonic materials for SPIE (The International Society for Optical Engineering).

On December 2008 he has been awarded a Marie Curie Fellowship by the European Union, and he is now on a leave at Harvard University.